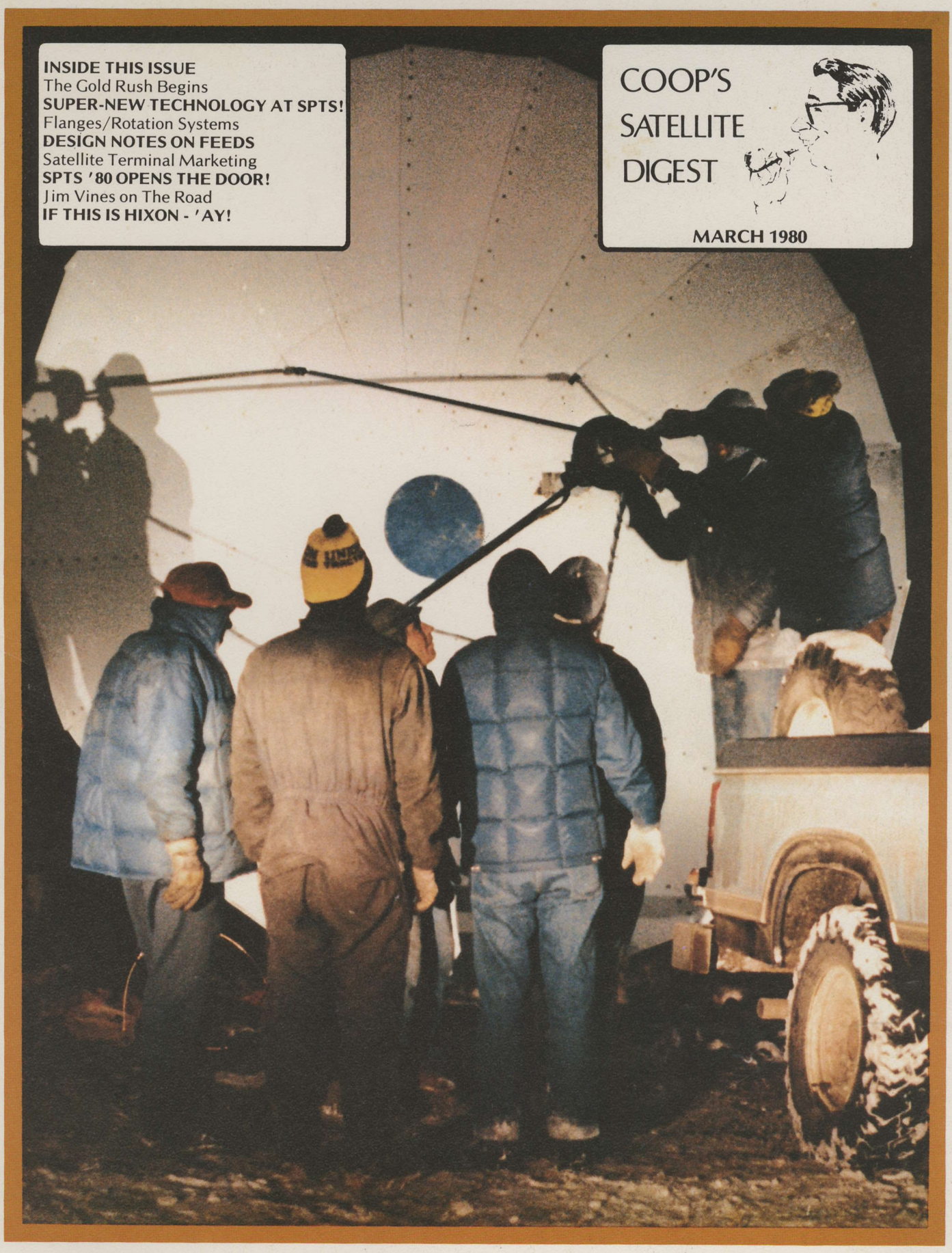
SAMPLE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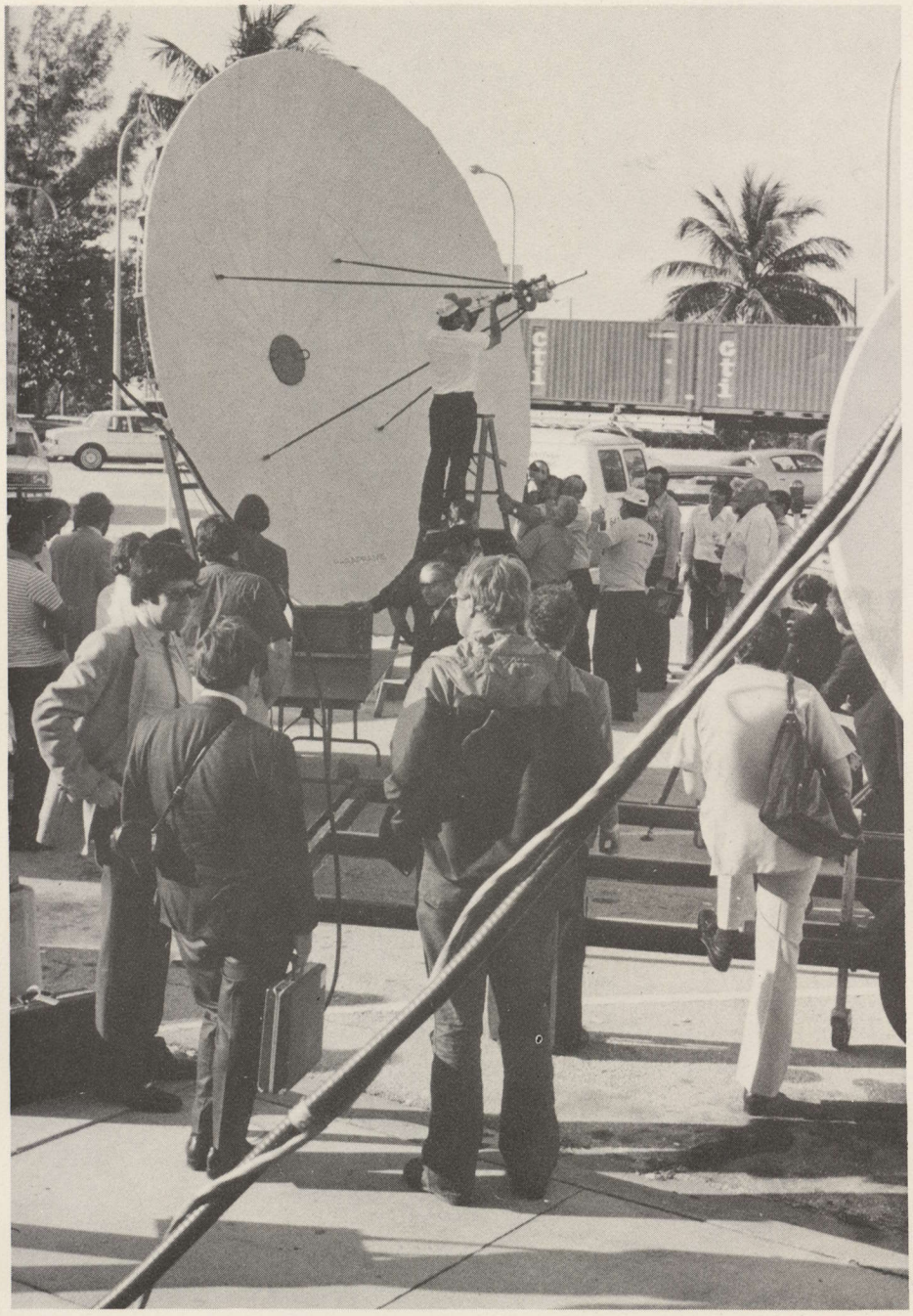
PARAFRAME



INTELSAT. If you are planning to work with EIRPs as low as INTELSAT's 26 dBw hemispheric beam, you need the high precision, structural strength and clean-gain of a BIG ONE from Paraframe. At Paraframe we do the big jobs every day; 12 foot, 15.9 foot and soon 24 foot high performance parabolas.

INTELSAT. The real test of a small system private terminal. At Miami's SPTS '80 the big ET/4.85 (15.9') high-precision parabolic by Paraframe delivered the impossible; Sao Paulo, Brazil via Intelsat IV-A (FI) parked over the Atlantic at 24.5 degrees west!

INTELSAT IV-A [FI]/Sao Paulo/At SPTS '80

PARAFRAME

1000 Sunset Drive West / P.O.Box 423 • Monee, IL 60449
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COOP'S SATELLITE DIGEST T1-3/80

COOP'S COMMENT ON TECHNOLOGY

RECOGNIZING ASSOCIATES

One of the subjects of conversation heard on several occasions at the recent SPTS Miami was the passing of Oliver Swan and how short sighted we would all be if some lasting memorial to Oliver's work and his memory is not established.

I learned of Oliver's passing via two-way radio. Susan called me on our VHF intercom to tell me the sad news. Several minutes later I realized that as I had been driving down an Oklahoma City street and receiving this sad news that the transmitter Susan was talking on was attached to an antenna...designed and built for me by Oliver many years prior.

To most of the satellite industry Oliver was a person who figured out a better (and cheaper and simpler) way to extract 4 GHz satellite signals out of the air. To a handful of people who have come into this new industry from the battlefields of cable television Oliver was also the chap who showed hundreds of cable engineers and technicians how to build better antenna systems and lower cost solid state amplifiers. To still others, like myself, Oliver was a very creative designer of antennas for HF (high frequency) VHF and UHF communications.

How do you create a memorium for Oliver? Let's return to that question a little later.

Recently we received a note from an old timer in the satellite business pointing out to us that there is a movement underway in Intelsat circles to have the geostationary orbit belt renamed after Arthur C. Clarke. The concept is straight forward enough and there is ample precedence for such an action. Years ago Megacycles were renamed Megahertz after the first man to recognize the principle of electromagnetic waves. Electronics is filled with such memoriums; the henry, the farad, and yes the ohm to name three we all work with daily. There is no serious contention as to **which** person first recognized the importance and feasibility of the geostationary orbit belt. Our October **CSD** reprinted the 'original' Arthur C. Clarke proposal for use of the geostationary orbit belt for 'space relay', as it appeared in the English publication **Wireless World** for October 1945. This formal publication was preceded by an internal memorandum dated May 25, 1945 from Arthur to a superior. The May 25, 1945 memo has survived the intervening years and during WARC '79 and a preceding trade show (TELECOM '79) an elegantly created poster was distributed by INTELSAT containing the **original** Clarke **memo**.

I suppose we could wait around for some August body of opinion makers to create a committee to study the feasibility of formally renaming the geostationary orbit belt the 'Clarke Orbit Belt'. We could...but we won't. I figure that may take them a couple of years and when they finally get around to doing the inevitable we'll have millions of additional laymen brought up thinking this magic circle above the equator is called geostationary when in truth it is called Clarke. So in our own small way we'll re-name it now; not because we have a special authority to do so or can in fact direct world opinion makers in this area. But rather because this is the right thing to do and sooner or later it will be done.

That means **we will make** changes in our Home-Satellite TV Reception Handbook, our Worldwide Communication Satellite systems wallchart, and of course here in **CSD** and in our manuals. And for awhile we'll footnote 'Clark Orbit' with an explanation of the man this magical circle is (re)named to honor. I think that those of you who write or speak on satellites should do the same, starting right now.

Now returning to Oliver Swan. His contribution to our science were much more general than Clarke's hypothesis; his impact on all mankind perhaps less dramatic than the 'Clarke Orbit Belt'. The closest I can come to pinning down an effect which Oliver first set forth is in the area of directional antenna arrays. Each time I write that Oliver invented the Log antenna I get several nasty letters from people who believe this work was first done by the University of Illinois or some other theoretical institution. Yet nobody writing such angry letters to me seems able to document that they did it prior to (or even near to) Oliver's development of a Log antenna in Stockton, California in 1951. So I remain unconvinced that anyone created a Log (or a Logi - the marriage of log periodic elements to passive yagi directors) **before** Oliver did so. That suggests that it might be appropriate to rename the Log the 'Swan' (antenna). Gaining widespread acceptance of this permanent honor for a man who was not a member of the IEEE (which passes upon such things) might be a foolish waste of time however.

So whereas we can "create" the 'Clarke Orbit' and make it stick through the simple subterfuge of putting it into use and then duplicating the usage millions of times in print, I'm afraid finding a similar honor for Oliver Swan may be more difficult. Suggestions? I'd like to hear them!

OUR COVER

HIXON, BC TURN ON - neither darkness nor numbing cold could stop this intrepid crew from completing installation of a new TVRO terminal for the community of Hixon, British Columbia. See page P2 this issue.

CSD TECHNOLOGY

COOP'S SATELLITE DIGEST (Technology Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Technology and Programming) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing.

SPTS '80 REPORT FANTASTIC NEW TECHNOLOGY!!!

They came from all over the world. From Austrialia, from Japan (the NHK network sent a film and reporting crew), from Africa, Europe and more than 75 attended from the Caribbean, Central America and South America. The crowd total was almost exactly equal to SPTS '79 in Oklahoma; give or take a few, the final count showed around 550 people had registered and attended.

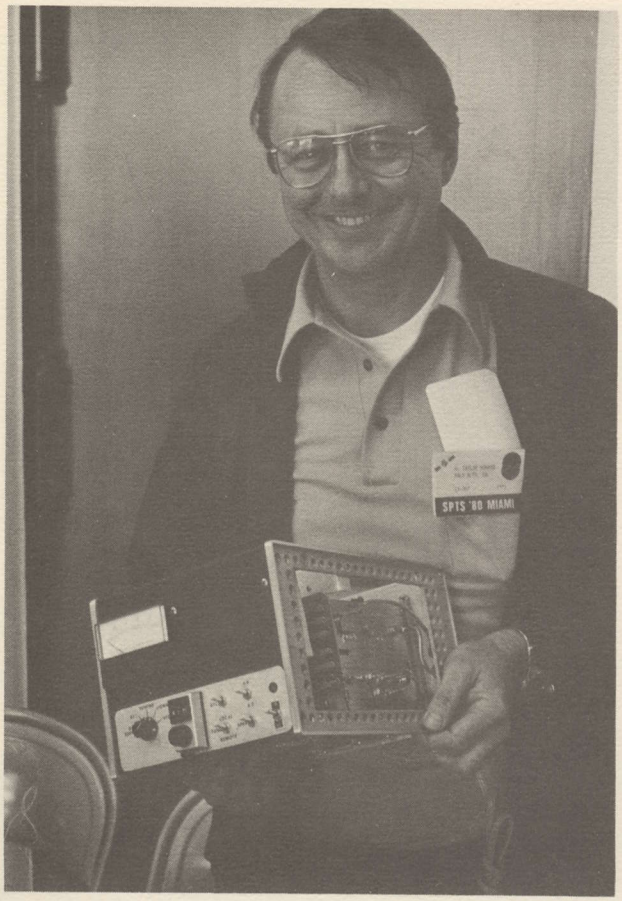
They came to discover whether the American created, American bred and American nurtured low-cost satellite terminal revolution could be 'exported' to their country. They came from Canada in droves, convinced that American domestic satellite reception was going to open up vast areas of Canada to real-world television. They came from throughout the United States including Alaska and Hawaii to investigage both home terminals for their own residences and the opportunities to distribute home terminals in their regions of the United States.

They came from professional firms and universities. People employed by firms that envision utilizing their own private uplinks were on hand to learn more about the low cost receive-only terminal. Example: An engineer associated with a seven state upper mid-west power grid cooperative was on hand to investigate controlling peak loads and switching systems via satellite inter-connection over his seven state area.

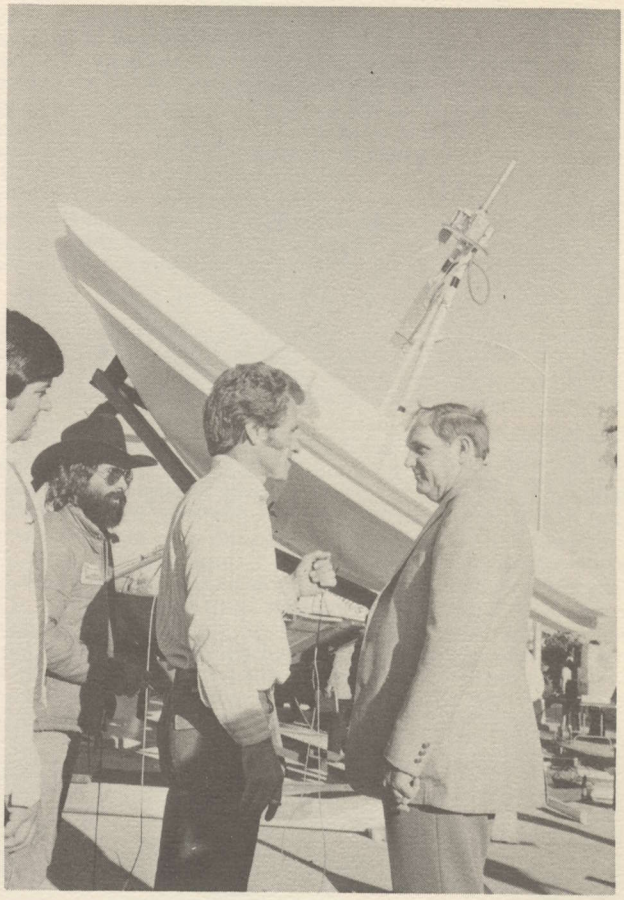
No, it was not a repeat of SPTS '79. Several people who attended the original SPTS last summer in Oklahoma indicated that there will never be another one like the first. Indeed there will not. The magic was still there but the entrepreneurial business world was there too and that presence affected every session and every private discussion.

Is the fun and games for private individuals who only wish to build their own private terminals all over? Hardly, it has barely begun. Taylor Howard and Robert Coleman will see to that. Howard and Coleman, who first met at SPTS '79, have now pooled their efforts to create several new innovations in receiver technology. Tay Howard proudly showed off his latest 'Howard Terminal Receiver' system, a nifty little package that features a double conversion technique with a phase lock loop demodulator and selectable audio subcarriers. Combined with Coleman the two are entering the commercial world with the new updated receiver design; offering complete circuit board

JAMMED WITH PEOPLE - the exhibit hall was always busy and always open [or so it seemed!]. More than 20 displays occupied booths from 100 square feet to 900 square feet each.



NEXT GENERATION HOWARD - Tay Howard proudly shows off his miniaturized 4 GHz latest receiver package. A built-in speaker allows you to utilize the receiver at the dish for quick identification of transponder sources without having to haul a video monitor outside.



PIONEER ROBERT COLEMAN chats with Randall Odem of H&R Satellite Systems in front of that firm's 10 foot home TVRO antenna system.

sets (including parts sourcing and parts layout documentation initially) at SPTS. Will this receiver end up in commercial production? Both Coleman and Howard smile and avoid a direct answer on this question but we are forecasting that by SPTS '80 in California this summer the receiver **will be** in commercial production. Several people offered Howard outrageous amounts of money for the model he brought with him to Miami and after being approached by numerous firms that indicated they would purchase 100 or more of the receivers the decision not to produce them commercially became very difficult indeed.

The presence with booths of Avantek, SCI and Dexcel was a prime indication that the 'private' or 'low-cost' (the two may **not** be the same) marketplace is starting to amount to something. As a companion report in our Programming Section indicates, substantial orders were written on the floor of the exhibit hall totaling nearly $2,500,000.

Receiver technology dominated the technical portions of the show. During INTELSAT reception tests (see Programming Section, this issue) it became evident that when you are dealing with **below**-threshold reception the PLL demodulator has an edge over conventional discriminators; at least those on hand. In complete fairness however when the system has achieved threshold carrier input levels, the fine-grain picture detail with conventional discriminator systems (such as the AVCOM) produce a more pleasing to the eye picture. The exception to this quick rule-of-thumb **might** turn out to be the Washburn receiver system which developed some operational problems before the single unit brought to Miami was made totally operational. Tests made by Washburn indicate that his approach to the phase lock loop demodulator may offer the best of both worlds; high sensitivity on below threshold signals and high picture definition on signals at or above threshold.

Clearly the PLL demodulators have constantly been improved since the first Howard Terminal manual appeared in 1979. There have been no major technological breakthroughs in this area; only constant (and still on-going) refinements which bought a few tenths of dB here and a half a dB there. And the improvements have come from dozens of engineers and technicians each working on their own, and then sharing their results and experiences in private conversations at SPTS events.

There was much discussion both during seminar sessions and privately about the LNA bottleneck. We can't pin our prognostication on any singular effort but we feel strongly that by SPTS '80 in California we'll see a price breakthrough in this hold-out from the commercial terminal world; that there will be cost effective LNAs in the 120 degree K area available in the $750 region. We base this fearless forecast on two factors; **the people** who are working on the problem at both professional/commercial and professional/private levels, and, the sudden dramatic **decrease in pricing** on GaAs-FET devices. The day of the $20 1.0 dB noise figure GaAs-FET may not be far away. And that will hardly be the bottom of this technology.

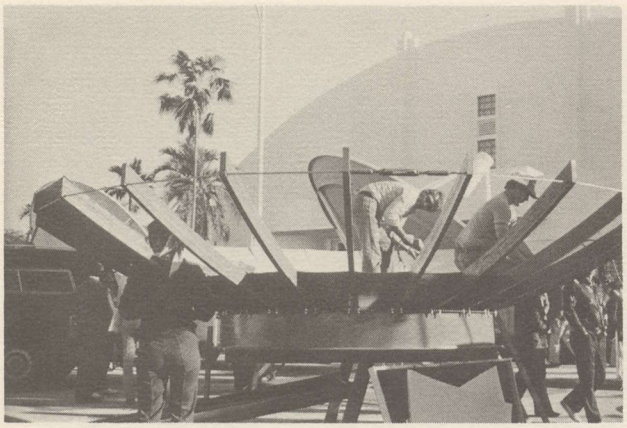
Antenna technology at SPTS '80 was truly exciting. The Paraframe antenna, which has become something of a 'standard' in the industry for 'stout' looks like it may broaden out into larger apertures. Jim Vines is seriously considering a 7 meter version after witnessing the results with his ET 4.85 (15.9 foot) model on the INTELSAT reception experiment. In

the knocked-down-for-shipping area the ADM 11 foot produced good quality pictures and attracted plenty of interest. The J.E. Thomas Lindsey Specialty Products 11.5 foot was transported to Miami in the back of a station wagon (which says something for its shipping size). John Thomas knows as much about metal bending as anyone in North America and his unique mount system has a lot of appeal. The smallest package at SPTS '80 was the Chaparral Communications (P. O. Box 832, Los Altos, CA 94022) 10 footer. Robert Taggart, who originally conceived this design back in the early 70's while earning his Ph.D. at Stanford demonstrated that he can knock the antenna down so that it can be shipped anyplace in the United States via UPS or parcel post for under $50!

Those firms with one or two piece antennas (largely fiberglass based) found business brisk. H & R Satellite Systems had a pair of antennas operational; a ten footer and a 16 footer. The Miami Bayfront Park Auditorium was 'blessed' with severe terrestrial interference from a fully loaded 3.7 to 4.2 GHz 'Ma-Bell' link less than 1.5 miles southwest of the site. Utilizing the Bayfront building as a shield, it was possible to boresight on FI without looking **directly through** the elevated (and line of sight save the Bayfront building) Bell terrestrial circuit but Bell 4 GHz energy sprayed sideways and backwards off of the tall downtown Miami buildings making 'clean' FI copy difficult. While many antennas parked on WESTAR or even ANIK B the adventuresome went after FI. H & R's pictures from their 16 footer were far better than one would expect in that environment and low EIRP level. Another antenna seen for the first time in public, STAR Antennas displayed a foam-fabricated 13 footer that was mounted on a low cost but extremely clever polar mount. The motorized antenna produced high quality pictures from FI on west through the orbit belt and as the companion Programming Section report notes, was the first to 'find' the INTELSAT bird at 24.5 degrees west.

VERY NIFTY - John Thomas [left] directs final assembly of his firm's 11.5 foot parabolic brought down from Lindsey Specialty Products in Canada.

A MUSHROOM PATCH UNDER CONSTRUCTION - An even dozen TVRO antennas from 10 to 16 feet in diameter filled to overflowing the parking lot of the Bayfront. This scene was Monday afternoon, just hours away from the Seminar opening.

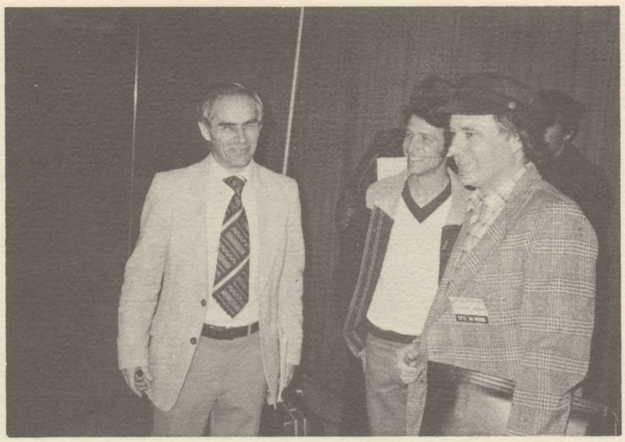


ASSEMBLING THE BIG ONE - Paraframe crew hard at work in the South Florida sunshine rushing to get the ET/4.85 antenna operational.

OVER THE TOP - A.B. Electronics Bob Behar [foreground, left] hops over the wall to bring their hardline indoors to their booth. AB's VHF Engineering Division showed off new 24 channel frequency agile receiver priced in $1800 region.

Many attendees were nervous about the 'gain claims' of the antennas on hand. Ideally, it was suggested, all of the antennas would be lined up on a single bird and then with a power meter the antennas would be compared utilizing a single (swappable) LNA and receiver. As you might suspect such a direct comparison is frought with both technical measurement difficulties and is never likely to come off simply because some of the antenna suppliers are **themselves** uneasy about their own gain claims. The next best thing to controlled measurements under antenna-test-range conditions is of course the direct bird-by-bird comparison of each antenna at a

A MUSHROOM PATCH IN OPERATION - from SATCOM FI [H&R antenna in front] through the orbit belt including ANIK B, SATCOM FII, the WESTARS and on east to INTELSAT IV-A FI the antennas dragged in pictures from throughout the world.



CANADIAN PIONEERS - Jan Spisar [left], David Brough [right] with ADM's James McGowan inspect reception on ADM's 11 foot antenna.

TV OUT FRONT - Gene Martin of Star Antenna [right, facing camera] explains his firm's polar mounted 13 foot antenna with the aid of a receiver and monitor set up at the antenna site.

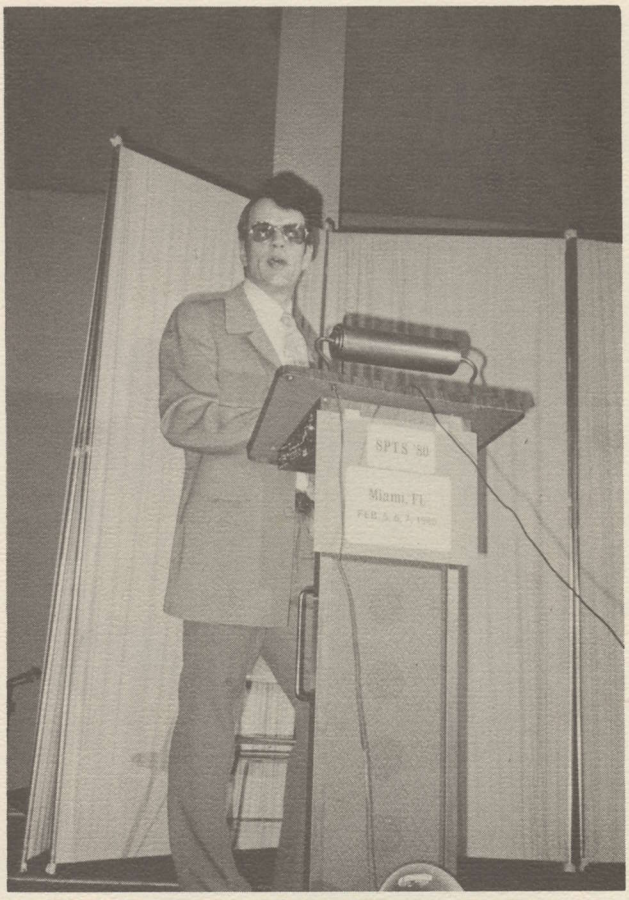
gathering such as SPTS '80. Many people did this on their own, moving from exhibit booth to exhibit booth and asking the exhibitors to run their antennas (where practical) through the orbit belt. Those exhibitors with the capability of remotely changing birds (with motorized mounts) clearly had the edge on those who did not simply because of the wide interest in different programming formats on the part of the attendees.

We forecast that at future Seminars virtually every operational antenna system will be so equipped.

If you are bottom line conscious, here are the latest set of numbers courtesy of the products on display at SPTS '80:

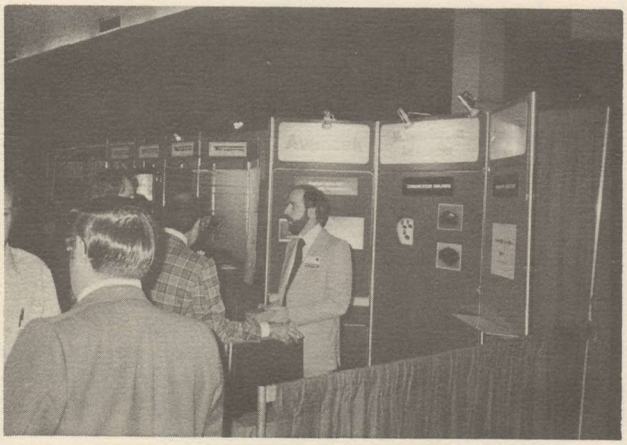
1) **Antennas** - You can acquire a ten foot surface for beween $750 and $850 from firms such as Chaparral or H&R. Feeds and mounts come extra.

ADM'S JAMES McGOWAN - The front parking lot filled up with antennas quickly and ADM [plus Lindsey] had to set up along the east side of the Bayfront Auditorium.

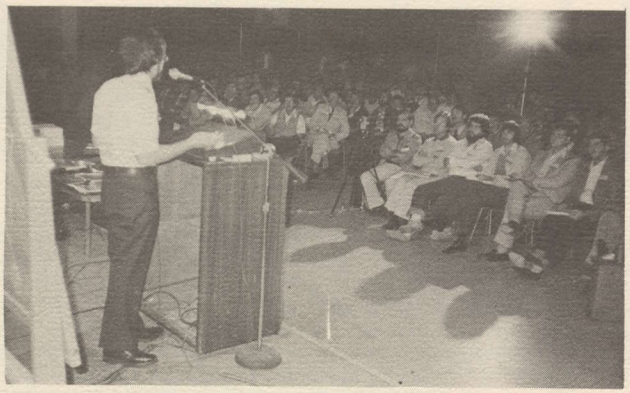


CLYDE WASHBURN ON STAGE - The new high performance Washburn Receiver attracted plenty of interest in spite of some operational problems with the unit on hand at SPTS.

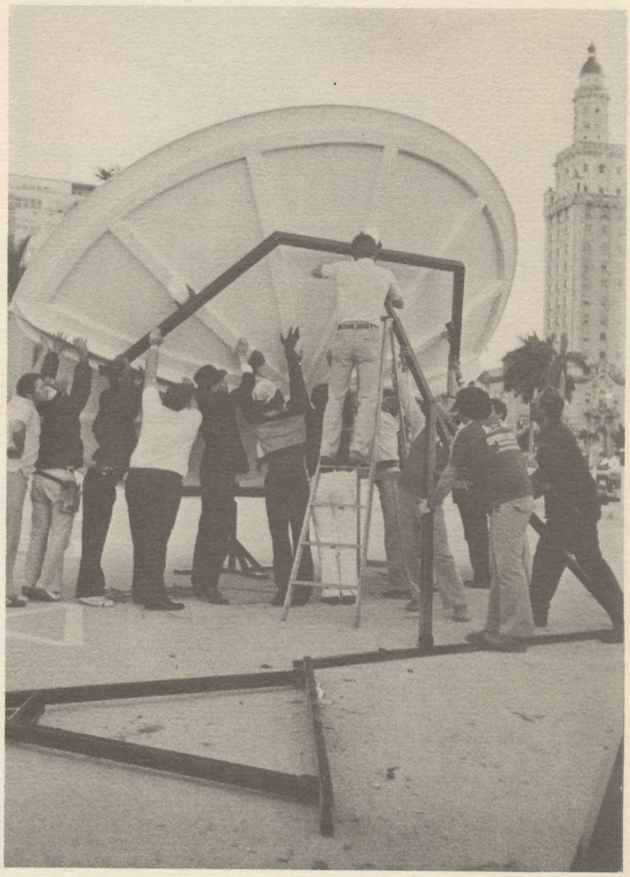
THE NEW AND THE OLD - An interesting mixture of fantastic new technology [SPTS] plus valuable old collectables [antiques] shared the marquee of the Bayfront. Several attendees noted that as fast as this industry is moving some of the 'new' hardware on display in Miami may be relegated to antique status itself by next year!



BOOTH AFTER BOOTH - Avantek was there in force showing off LNAs plus devices such as the popular VTO series oscillators. DEXCEL and SCI rounded out the LNA suppliers displaying their products.



SHUCH AND PACKED HOUSE - H. Paul Shuch found hundreds of people interested in the technology of low-cost TVRO receivers and his latest receiver version did an excellent job on the marginal INTELSAT signals [see Programming Section, this issue CSD].



ONE MAN PER FOOT - Raising the 16 foot H&R fiberglass antenna into position brought out 16 volunteers. Nearly sparklie-free reception from SATCOM FI was achieved with this antenna even in Miami's low EIRP area.

2) **LNAs** - The pricing still seems to hang between $995 and $1200 for 120 degree K LNAs. Dexcel's 30dB gain model is lowest while 50 dB gain versions from Avantek and SCI are but a couple of hundred dollars more.

3) **Receivers** - Wired and tested radios range from $1800 (A.B. Electronics/VHF Engineering) to around $2700 (Washburn receiver through Ramsey with 'manual discount).

Thus a person could acquire the three basic elements for a commercially produced terminal for as little as $3550 and then plan to spend another $500 or so to complete the terminal with an antenna feed, mount, hardline and concrete. From this bottom-line the prices go all the way up to over $15,000 for completely installed turnkey systems.

There are some plateaus being reached here which anyone who intends to purchase an assembled terminal (in quantity of one) should be aware of. Antennas are approaching (at $750/$850) a practical minimum. Receivers can be expected, we feel, to drop down to perhaps the $1400/$1500 region (wired and tested) before the year is out. LNAs will similarly drop to at least the $750 region in the same time span. This re-adds then to a basic three-part package in the $3000 region by year's end. And there are of course some savings from these pricing levels possible when you go in as a dealer or distributor and begin talking about quantity buys of 25 or so per annum.

Meanwhile it is still possible to assemble your own terminal utilizing your own labor (perhaps 70-100 hours total) and buying component parts (and circuit boards from the numerous sources now offering same) for approximately $1,000.

FLANGES AND ROTATION SYSTEM DESIGN NOTES

For those who have gotten into the private terminal reception area by acquiring one of the Stanford (Mill Cross) ten foot dishes with the button hook **WR-284** waveguide here are some observations based upon my own experience plus some measurements conducted independently. For those who may have acquired a surplus parabolic dish via routes other than the Stanford Mill Cross project disposal yard, the information contained here may help you better understand how to obtain peak operating performance from your surplus antenna.

I had the opportunity to evaluate a wide assortment of (DEXCEL) LNAs and homebrew amplifiers with my ten foot system. In preparation for these tests an electrical transition section was machined to provide for adapting the WR-284 feed output to the smaller WR-229 flanged LNA input. (WR-284 covers 2.6 to 3.95 GHz while the WR-229 hardware covers 3.3 to 4.9 GHz; see page **T8** for November 1979 **CSD**.) During the tests, which were conducted with Taylor Howard of Stanford plus Yozo Satoda, Art Kawai and Ken Wong from DEXCEL in attendance, several satellites and various transponder channels were observed. For LNA comparison tests and tests of various LNA mounting techniques transponders were chosen which were at or slightly below the FM threshold of the receiver thus insuring that even small signal level differences would be apparent. The mechanical/electrical adapter shown in **figure one** was bolted to the WR-284 feed flange. Various DEXCEL LNAs were evaluated, each being bolted to the flange plate in the testbook fashion by **tightly** securing a bolt through **each** of the mounting plate/flange holes. During this mounting and unmounting of many LNAs it quickly became apparent that equally good results could be obtained by simply **holding** the LNA to the plate with one's hand, and, we discovered that one could **separate** the LNA flange plate from the WR-284 adapter flange plate by **as much as 1/2 inch** without noticeable signal degradation!

This was then taken one step further and the carefully constructed adapter (see figure one) was taken **off** of the antenna and the LNA flange was held against the feed flange on the button hook antenna. At this point it because apparent that the precision adapter flange contributed nothing to picture quality! In fact the mis-matched flanges could be rotated up to 1/4 inch in either direction (from being in line with one another) and there was no noticeable picture degradation. The end result of all of this testing was that a transition section from WR-284 to WR-229 perhaps is **not required** at all and any method that can be created to physically mount the LNA to the feed output is probably acceptable. For those who simply feel better having a nicely machined adapter, see figure one.

Several non-waveguide bi-polar and GaAs-FET amplifiers were placed on the antenna system utilizing the WR-284 to type N adapter furnished with this particular antenna. We encountered no problems with any of these various configurations including elimination of the input circulator.

One of the problems presented by any button hook antenna feed is rotation for changing from horizontal to vertical (or vice versa) polarized signals on SATCOM birds. **Figure two** shows a scheme I have worked out to accomplish this with this particular ten foot antenna and feed. It is likely that the same technique will function with virtually any button hook fed antenna. Note that you remove the aluminum ring mounted on the antenna's surface and machine it as shown in figure two. The polar axis drive requires about 20 turns per degree. A 100 RPM motor results in five degrees per minute which is slow (since satellites are 4 degrees or further apart) while 1000 RPM is simply too fast to stop accurately on each satellite. Within this range however one can often find surplus motors that will do the job very inexpensively.

by
Lance Ginner
Los Altos, California

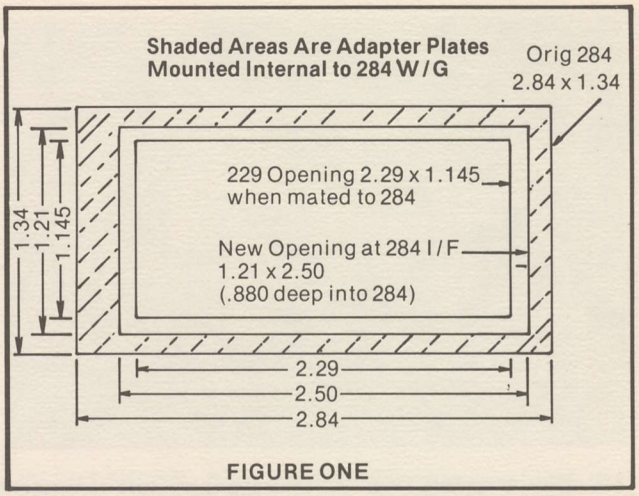
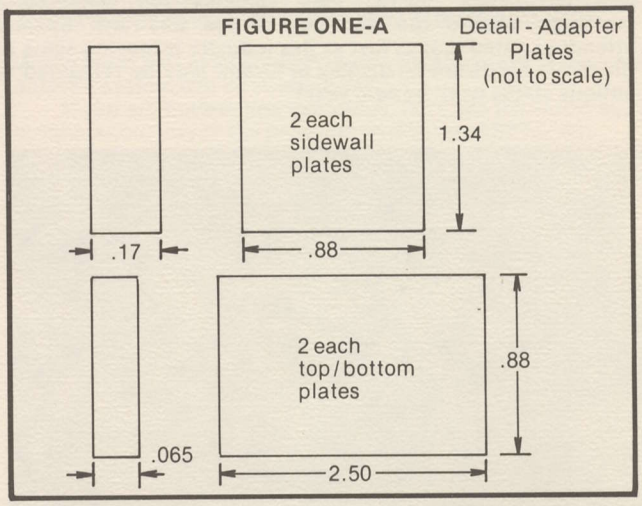


FIGURE ONE



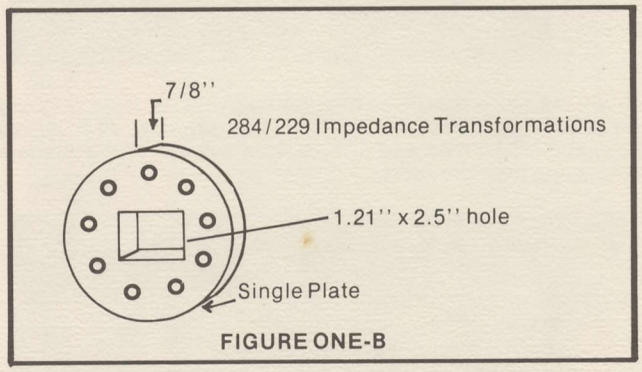


FIGURE ONE-B

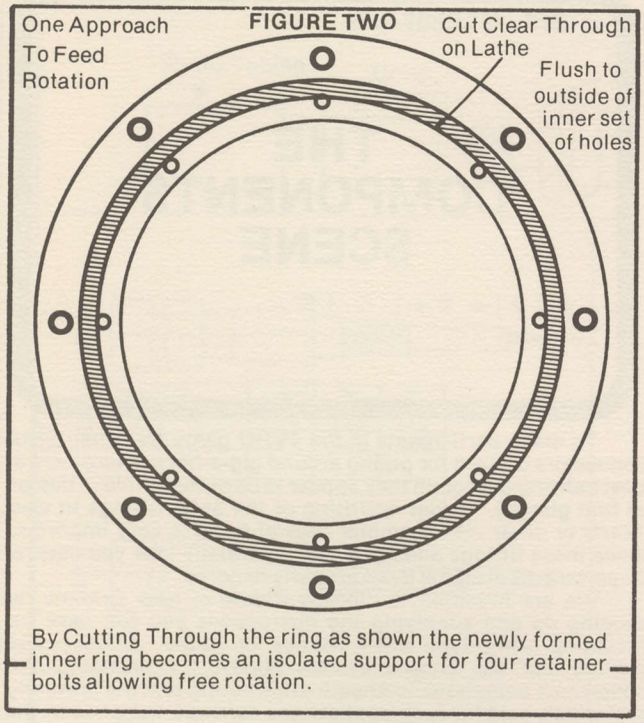
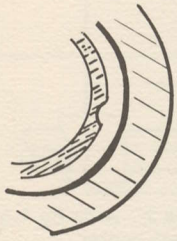


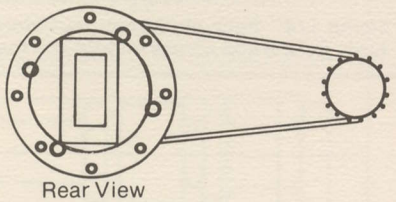
FIGURE TWO

By Cutting Through the ring as shown the newly formed inner ring becomes an isolated support for four retainer bolts allowing free rotation.



Use Bolt From Backside (4 each) with large washer. Lubricate with water-proof grease and adjust for loose fit - feed can be rotated easily with a TV rotor

Mount a Large Bicycle drive sprocket to the inner assembly and use a bicycle chain drive to a small sprocket attached to a TV rotor



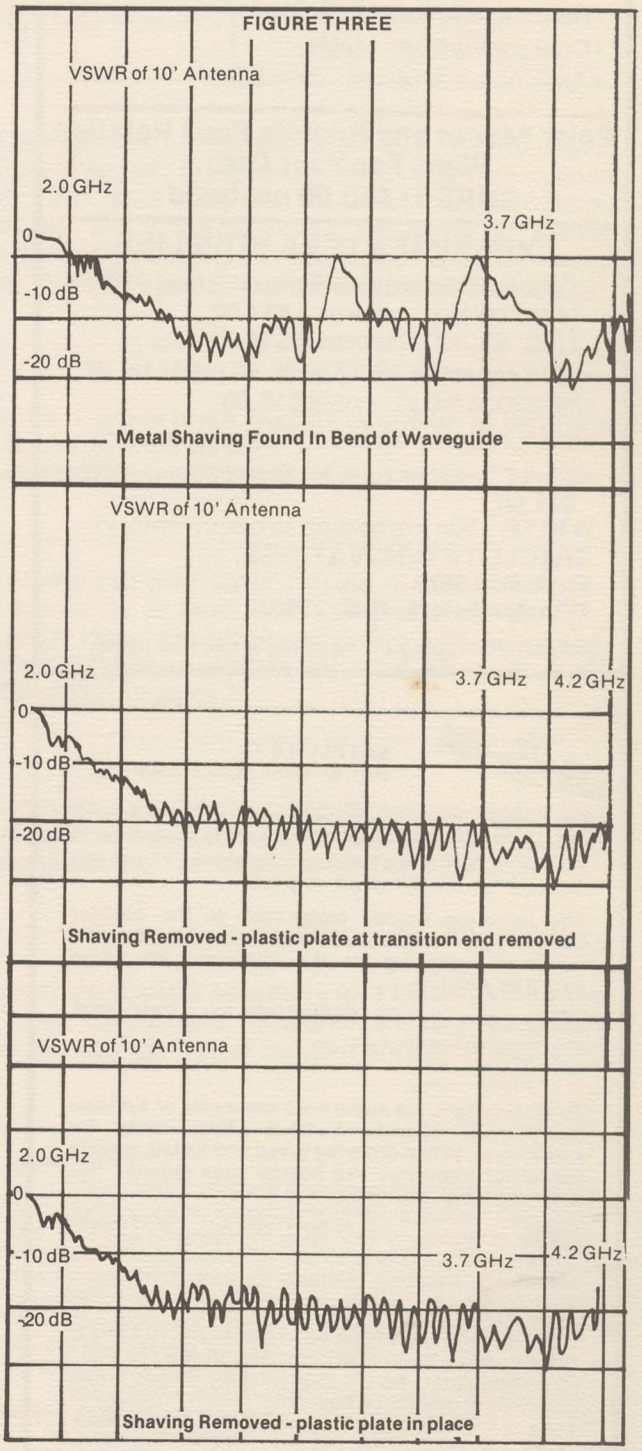
Rear View

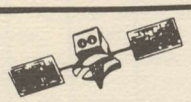
FIGURE TWO-B

I also had the opportunity with the cooperation and assistance of Hans Jekat at Hewlett Packard to place the feed **and the adapter** (see figure one) on a test bench and measure the match or return loss of the system. See **figure three**. Note that the bottom display shows the VSWR to be 1.2 to 1 or less (return loss 20 dB or better) over the frequency range of interest; 3.7 to 4.2 GHz. HP's Jekat found the VSWR to be almost infinite at several frequencies when he **first** checked the system (see figure three, top display). The problem was traced to a very fine piece of aluminum shaving, horsehair like in size, which had lodged inside the waveguide bend. This suggests that any feed you acquire, especially if surplus, should be 'cleaned' by dragging some rags or wadding through it several times to insure that something is not lodged inside.

In many of the feeds you will find a small plastic plate (sometimes loose) glued to the wall inside. This plate is intended to be a phase delay correction plate and as noted in figure three, middle and bottom VSWR plots, it has no effect on the VSWR and can be left in place or removed as you wish.

FIGURE THREE



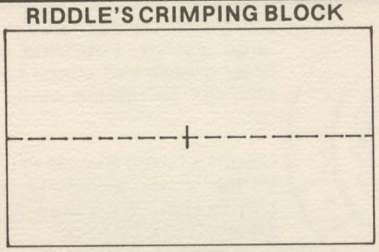


THE COMPONENTS SCENE

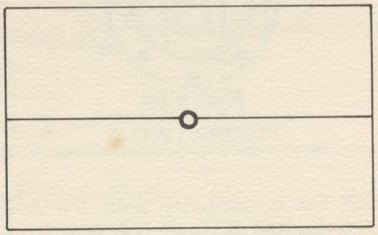
To many participants in the TVRO game the small SMA connectors utilized for piping around gig-a-hertz energy are at best baffling (although they appear to be quite simple in design at first glance). Proper outfitting of the SMA fittings to your 174/U or other .141 diameter coaxial cable is very important since these fittings and cable can potentially lose you several important dB of signal if not properly handled.

We are indebted to Lindsey Riddle of New Orleans for digging up and supplying the instructions you see here for installing crimp-type SMA fittings on cable. Lindsey also worked out the simple system shown for crimping the connectors onto the solid-sheath cable noting that the crimping tool widely sold for such applications carries a list price in the $140 region!

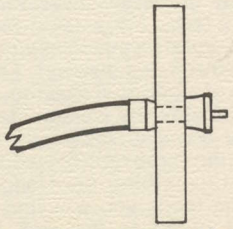
RIDDLE'S CRIMPING BLOCK



Using 1/4'' thick aluminum, cut block 2'' wide by 1.5'' high. Scribe line across middle and mark center.

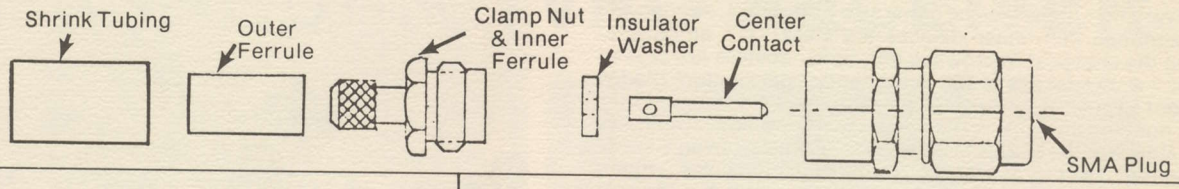


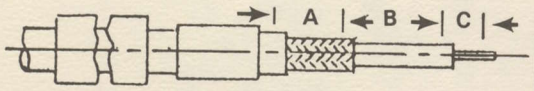
Drill hole (#35 drill or appropriate size) for RG174/U (or other) cable; cut across to separate halves.



Place connector to be 'crimped' into hole on bottom half and replace top half as shown. Whack with a hammer to 'crimp' the ring.

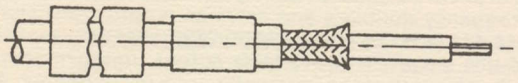
ASSEMBLY PROCEDURE FOR CRIMP TYPE SMA CONN. CABLE ACCOMODATION
RG-188A/U,-316/U,-174/U,-179B/U & -187A/U



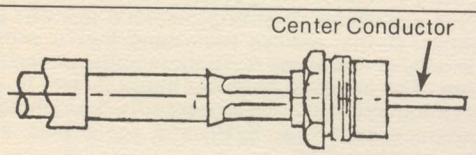


Connector	A	B	C
901-9601-3	.270	.230	.120
901-9601-3SF	.270	.230	.120

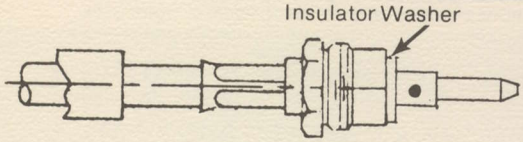
Slide heat shrink tubing and outer ferrule onto cable. Strip cable jacket, braid and dielectric to dimensions shown. All cuts are to be sharp and square. Important: Do not nick braid, dielectric or center conductor when cutting. Tin center conductor. Avoid excessive heat to prevent swelling of cable dielectric.



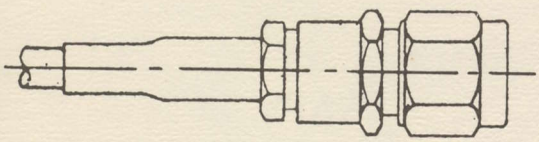
Flare end of cable braid slightly as shown to facilitate insertion onto inner ferrule.
Important: Do not comb out braid.



Slide clamp nut and inner ferrule under braid until cable dielectric is flush with front of inner ferrule. Slide outer ferrule in place and crimp with Amphenol tool No 227-944 and die set 227-1221-03 cavity "A" (M22520/5-03 Closure A.)



Place insulator washer on cable center conductor and bottom against inner ferrule body. Contact must butt firmly against insulator washer while soldering.



Screw ferrule-contact assembly into body and tighten to 20-25 in./lbs. torque. Slide heat shrink tubing over ferrule, up against clamp nut and shrink by applying heat.

THE WORLD ABOVE 10 GHz

by
Robert M. Richardson
Richcraft Engineering Ltd.
Drawer 1065
Chautauqua, N.Y. 14722
[716]753-2654

SUMMARY

Last month's episode described how ridiculously simple it is to build a proportional temperature control sub-system for the 10 GHz Gunnplexer that will maintain a constant 120 degree F temperature for the GPX (Gunnplexer) module over the range of -20 to +85 degrees ambient within a suitable weatherproof balsa wood enclosure. A simple electronic thermometer consisting of only an open base transistor and 1 milliamp ammeter was also described.

SPECIAL MARCH FEATURE

How about a crystal-controlled weak signal source for both 4 GHz and 10 GHz that may be built for less than $50? That may be frequency **or** amplitude modulated? That will allow you to put your 4 GHz or 10 GHz receiver **exactly** on the frequency you wish? That will allow you to **align** your 4 GHz or 10 GHz parabolic antenna to an azimuth heading within a fraction of a degree you wish? That will allow you to "**phase-lock**" your 4 GHz or 10 GHz oscillator to a temperature stabilized crystal-controlled source? Sounds impossible for less than

$50? No...it is not. As a matter of fact it is incredibly easy to do.

A VERY SMALL BIT OF THEORY AND PRACTICE

Every non-linear device generates harmonics. Among the most common non-linear devices are class "C" amplifiers. Among the cheapest microwave non-linear devices are crystal diodes; i.e., a package of 200 point-contact germanium diodes for about $2 from Poly Paks. If we combine a crystal oscillator and a number of class "C" transistor multipliers/amplifiers (for instance in the $39.95 price class VHF Engineering TX-432 transmitter) with a highly efficient microwave diode multiplier/antenna we have ingeniously created a crystal controlled microwave power source that will do all sorts of good things. Believe it or not, the little TX-432 transmitter and 1 cent diode multiplier/antenna shown in **figure 2** has actually transmitted a signal 1-1/2 miles across Lake Chautauqua (NY) on 10,152 MHz! This is the 22nd harmonic of the TX-432's 461.450 MHz output which is not exactly an overwhelming signal level at 10 GHz. The truth of the matter is that we used very "high class" 25 inch diameter parabolic reflector antennas ($7 each Snosled dishes) at each end of the circuit and relatively narrowband (about 5 kHz) FM deviation. So much for theory and practice. Now let us build one of these gizmos.

VHF ENGINEERING TX-432 1 WATT FM TRANSMITTER

This little 5 transistor plus one integrated circuit engineering marvel of a kit may be constructed and tuned in 1 or 2 evenings at most. Instructions (from the manufacturer) are clear and explicit. Output is at 24 times crystal frequency in the 420 to 470 MHz range. Since this is a satellite journal, let's assume we wish to build a crystal-controlled weak signal source with output on **exactly** 4.0 GHz, near the middle of the band (3.7 to 4.2 GHz). As such we would order a crystal for the TX-432 at exactly 18.5185 MHz. Crystal specs to order are: fundamental cut, ground parallel at 20 pF, .005% tolerance at 18.5185 MHz. The crystal (at $5 to $7) is the single most expensive item in the entire system if you already have a tripod. Now let's see how we get to 4.0 GHz.

Although the crystal oscillates on its fundamental frequency and may be heard in a general coverage receiver at 18.5185 MHz, the transistor oscillator output is on the 3rd harmonic at about 55.5555 MHz. The next three transistors are class C frequency doublers and drive an output transistor at exactly 444.444 MHz as a straight through class C amplifier. Inspite of this stage's 444.444 MHz output tuning/matching network, the strength of the harmonics are a joy to behold. The author built a 900 MHz output TX-432 a few years back for a passive microwave anti-shoplifting system he invented and the 900 MHz output was almost as strong (within a few dB) as a straight amplifier. Do not believe everything that is printed about the efficiency of frequency multipliers as the majority of them are **wrong**. The message here is: "build it, test it, and measure everything yourself," before accepting **anything** as sacrosanct gospel except I = E/R...and sometimes even Ohm's Law may be misleading.

FIGURE ONE - Multiplier, injection antenna beneath styrofoam cup.

The little TX-432 even includes an FM integrated circuit configured to perform high impedance microphone pre-

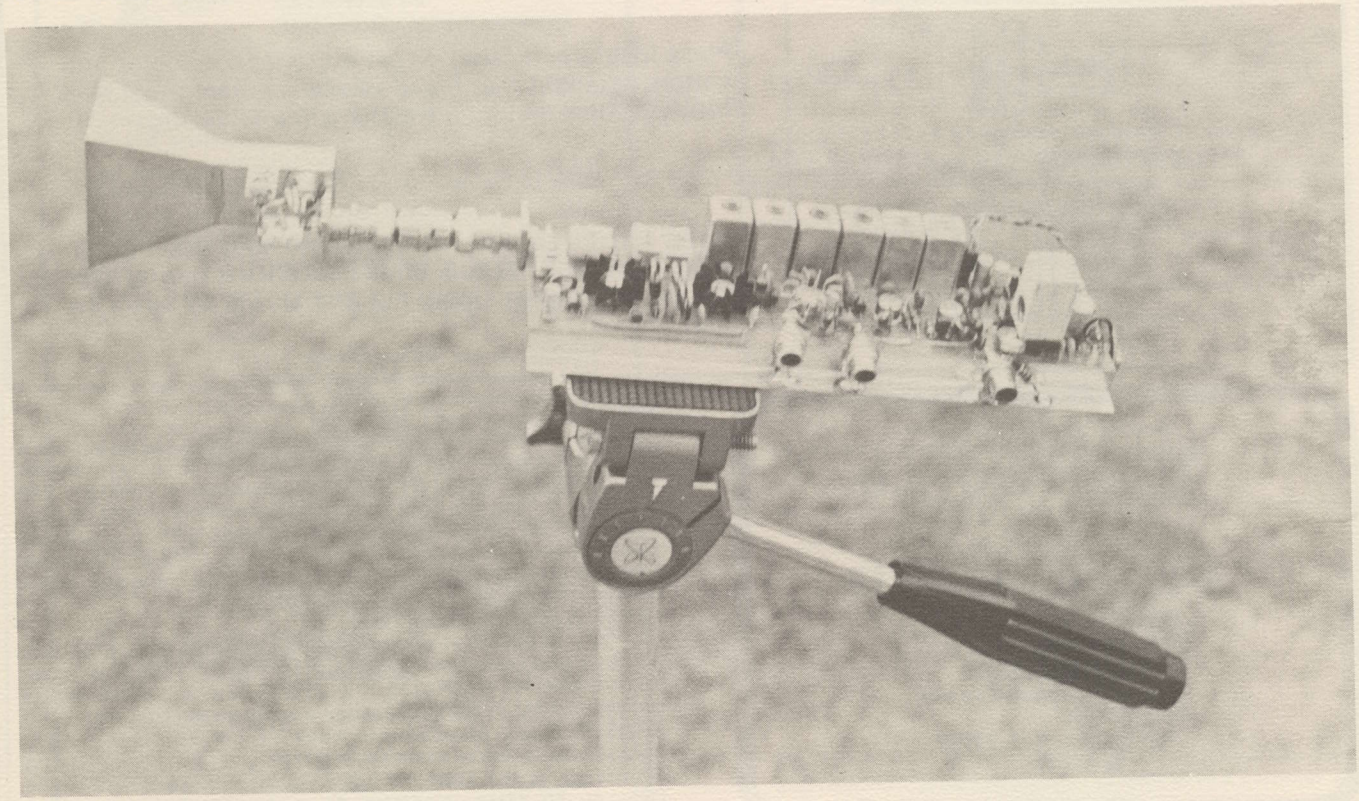
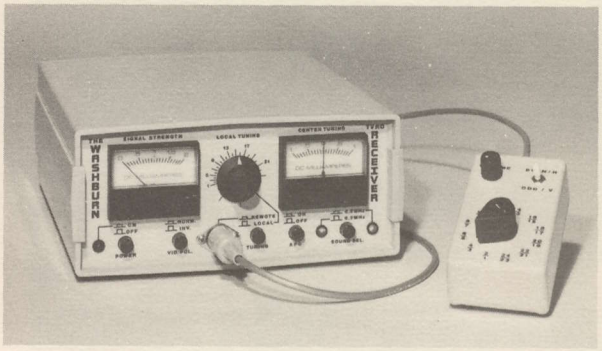


FIGURE TWO - TX-432 transmitter, multiplier, horn antenna.

THE WASHBURN TVRO RECEIVER

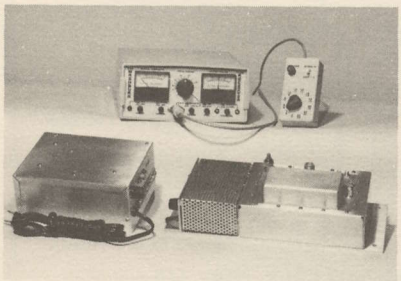
The WASHBURN TVRO RECEIVER is a complete, high performance unit which provides excellent quality picture and sound reception from television satellites. The easy to operate format makes the WASHBURN receiver ideal for any application where non-technical users are encountered, such as the home, job site or resort. Advanced state-of-the-art, technical features such as; extended threshold demodualtion, full band width video and wide range AFC insure professional quality performance for years to come.

The WASHBURN, receiver of the 80's!



STANDARD FEATURES:

- ***EXTENDED THRESHOLD***. . .a state of the art approach to threshold extension that allows sparklie-free reception of program material with CNRs of 8 dB and above, achieved with-**out** compromises in IF bandwidth or video bandwidth and with special design attention to maintaining video phase and amplitude linearity as one would expect to find in a high dollar commercial receiver package.
- ***LOW DISTORTION AUDIO***. . .a unique approach to recovering **all** of the audio bandwidth present on the satellite transmission utilizing a true low-distortion, low-noise, high fidelity audio output with remote control and **automatic** selection of either the 6.2 or 6.8 MHz sound subcarriers; with indicators to show which audio subcarriers are present and a priority selection system so that the presence of some other modulation format (such as slow scan video) on 6.2 MHz will not be selected for listening (but a **normal** audio modulated subcarrier on 6.2 MHz on a different transponder **will** be heard.) Additionally, CCITT (or ANIK) subcarrier frequencies different from the normal 6.2 and 6.8 MHz North American DOMSAT bids can also be received and deemphasis supplied by component value changes.
- ***HIGH PERFORMANCE AFC***. . .that works as well as the RCA home receiver Colortrak® system and provides a very high overall level of dispersion cancellation, eliminating any need for a complex and expensive frequency synthesis system.
- ***AUTOMATIC AND PRECISE***. . .feed rotation control using a readily available, modest-in-cost (TV) antenna rotor assembly.
- ***FULL FUNCTION METERING***. . .dual meters to show received signal carrier to noise ratio (CNR) and AFC center tuning. Meters calibrated directly in db and MHz.
- ***VTR COMPATIBLE INPUTS AND OUTPUTS***. . .to provide easy back-feeding of a home (or neighborhood) MATV system, plus simple off-bird-recording without additional switching or complex cabling.
- ***PROFESSIONALLY DESIGNED AND MANUFACTURED***. . .utilizing an out-of-the-way down-converter (mounting separate from the demodulator proper) with an LNA power supply, a feed rotation system (to allow operational remote control of the feed point antenna for separate reception of vertically and horizontally polarized transponders), a small demodulator console with full provisions for constant monitoring of the system performance, and, a hand-held remote control that allows the viewer to adjust the system to each of the 24 channels found on SATCOM birds (or alternately 12 or ANIK, WESTAR birds) with a remote control. This design allows operation by a non-technical viewer without the requirement for special instructions.



WASHBURN RECEIVER, *fully aligned with one year parts and labor warranty*..... **$2995.00**

WASHBURN RECEIVER, *kit form, 90 day parts only warranty, less rotor motor* **$1495.00**

ramsey electronics **BOX 4072 ROCHESTER, NY 14610 (716) 271-6487**

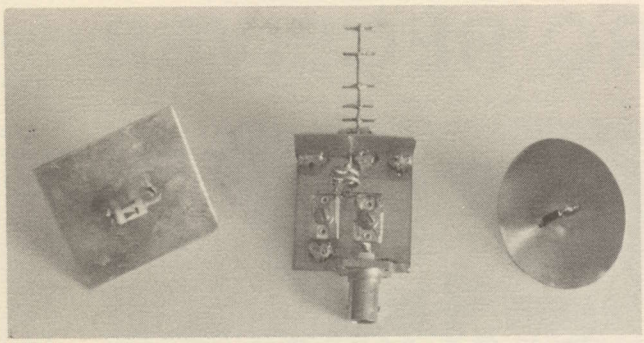


FIGURE THREE - experimental 10 GHz multipliers, antenna

emphasis and audio amplification. A variable resistor sets the level of deviation by varying the amount of audio voltage presented to a varactor which FM's (or PM's - your choice) the crystal. You can imagine what an incredibly small amount of modulation is required for 5 kHz deviation at the TX-432's output **times** 22 for 10 GHz. Additionally, a capacitor may be used to "bend" the crystal's frequency within reasonable limits to the frequency that you desire. Even a cheapy Heathkit counter is more than adequate for the majority of applications when measured at the fundamental frequency or better yet at the 3rd or 6th harmonic to prevent loading the crystal and associated circuitry.

If you could look at figure 2 with a magnifying glass you can see the 3/4" square balsawood housing around the crystal. What does it do? Why it PTC's (proportional temperature controls) the crystal just like **CSD**'s World Above 10 GHz described in the February '80 issue. The only significant difference is that it utilizes a 1 cent "leaky" germanium Poly Paks diode for the temperature sensor instead of an expensive 99 cent open base germanium transistor. Since the heat radiating area is many orders of magnitude smaller than the Gunnplexer module, the heating requirements to maintain the crystal at a constant 120 degree F (plus or minus 1/100th of a degree F) are minimal and average 5 to 10 milliamps in the +50 to +75 degree F ambient range. In the 10 GHz band we are using the crystal's **528th harmonic** and for 4.0 GHz output we are using the crystal's (24 x 11) **216th harmonic**; hence it is obvious why we must temperature stabilize the crystal if we desire laboratory standard frequency calibration accuracy or if we choose to phase-lock our 4 GHz or 10 GHz oscillator to it. For short-term measurements the proportional temperature control may be ignored **if** we have an accurate digital frequency counter reading the TX-432 crystal's 6th harmonic at 111.111 MHz across a resistor (R6) on the input to the doubler transistor (Q3). For brevity' sake, we rounded off the crystal's actual frequency of 18.51851852 to 18.5185 MHz. The aforementioned trimmer (C30) will allow you to adjust **exactly** on frequency if you are patient.

For those intrepid TV satellite hunters without access to lab standard test equipment, **don't** worry and fret. A .005% tolerance crystal from a reputable crystal grinder like JAN Crystals, Inc. (located in Ft. Myers, Florida) will put your receiver more than close enough to 4.0 GHz for most practical purposes.

FREQUENCY MULTIPLIER/HORN ANTENNA CIRCUIT

Figure 5 illustrates this circuit. Its job is three fold:

1) To match the 50 Ohm input impedance from the local or remote TX-432 444.4444 MHz signal to the optimum impedance the crystal diode wants to see to generate the maximum harmonic energy for a given power input.
2) Provide a very modest "Q" environment for the crystal multiplier so that harmonics other than the desired 9th harmonic are somewhat attenuated...not much, but some.
3) Provide a reasonably efficient waveguide to horn antenna with a beamwidth on the order of 50 to 60 degrees between 3 dB down points.

Somewhat surprisingly, this uniquely simple circuit accomplishes all 3 jobs quite well. It yields an SWR of 1.1 to 1.5 when properly tuned and measured with a Bird Thruline Wattmeter (using a 1 watt 400 to 1000 MHz slug), inserted between the TX-432 and multiplier/antenna assembly.

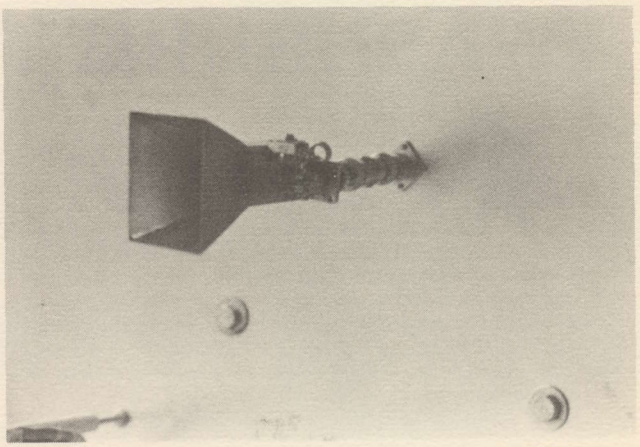
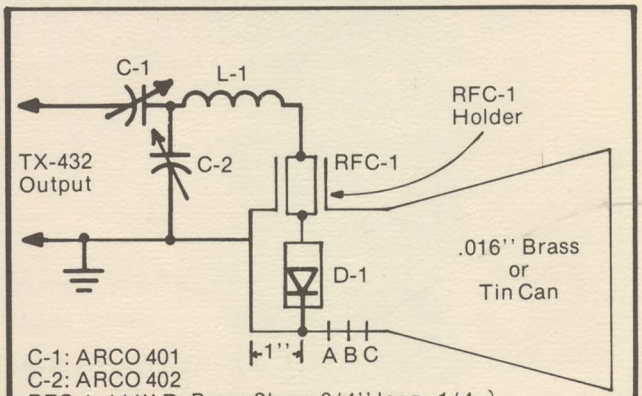


FIGURE FOUR - 10 GHz horn/multiplier on dish

CONSTRUCTING THE 4.0 GHZ MULTIPLIER/ANTENNA ASSEMBLY

If you were in a professional microwave laboratory you would undoubtedly use heavy gauge brass sheet with triple silver plating after the assembly was completed. Since you are most probably located on a remote Montana sheep ranch at least 150 miles from nowhere and do not have a plating shop down the hall we will skip the silver plating bit and maybe even make the waveguide/antenna assembly from tin cans rolled flat if you do not have a ready supply of .016" thick (or up) sheet brass. Will it make a **giant** difference? In all actuality, the answer is **no** it will not. Except with rather sophisticated test equipment, you will not be able to even measure the difference in efficiency between the tin can and silver plated brass waveguide/horn antenna assemblies **unless** you allow it to lie out in the rain and rust, or use it as an alternate boat anchor in an acidic pond. Another pleasant surprise, we hope. For those who wish to dig deeper into the subject of silver plated brass versus tin can cavity construction, we suggest you read the article in the April 1978 issue of **'73 Magazine**, "How to Succeed On 1296 MHz," (pages 32 to 35) by the author. In this case a 1296 MHz cavity amplifier was constructed using a "cat foot" tin can for the 25 watt cavity amplifier. There was no measurable difference in efficiency between amplifiers constructed from silver plated brass and those made from cat food cans. The "key word" here is of course, "measurable."



C-1: ARCO 401
C-2: ARCO 402
RFC-1: 1/4" D. Brass Slug x 3/4" long - 1/4 λ
L-1: 2 Turns #16 1/4" ID x 1/2" long.
D-1: 1N21D or Poly Paks Point - Contact Germanium
RFC-1 Holder: 5/16" ID Brass Tube x 3/4" long.
NOTE: Wrap RFC-1 with scotch tape for press fit.

FIGURE FIVE

Naturally there is a difference. It is just that it is an "insignificant" difference. Regardless of what you choose to build your waveguide/horn antenna assembly from, it **must** be flat. Lay out the pattern with a scribe using the dimensions given in **figure 6**. If you do not have a sheet metal brake, simply bend-up the waveguide assembly in a vise using a few scraps of white pine for shims and beat it into shape with a hammer. None of the dimensions are particularly critical, but try to hold the **accuracy** to within about **1/16 inch** if you want top performance. Use at least a 50 watt Ungar soldering pencil or larger iron for soldering the cavity and horn antenna segments together with lots of "Nokorode" sodering paste to assure perfect joints. When everything is soldered together, use a fine-grain flat bastard file (no offense intended) to smooth **all** internal and external joints. As the 4.0 GHz waveguide/horn antenna assembly is considerably larger than the 10 GHz system shown in figure 2, we suggest you mount the TX-432 **and** the multiplier/horn antenna assembly on a 3 inch wide sheet of double tempered 1/4" thick masonite about 12" long. The masonite sheet would then be attached to your camera tripod or whatever you choose to mount the assembly upon. The tripod is convenient and easy to adjust.

FINAL TUNE-UP AND TEST

We find a small 12 volt 10 amp hour capacity motorcycle storage battery will run the complete system for hours on end and is light enough to make the system truly portable. Total system current drain is less than 1 amp.

For those big spenders who do not wish the pleasure of sorting through a bag of 200 Poly Pak point-contact germanium diodes for $2.00, we suggest you substitute 1N21D diodes (available from G & G Electronics in NYC) for about $3. All the 1N21D diodes tested so far put out a booming signal on the crystal's 528th harmonic in the 10 GHz band and will literally "blow your mixer's mind" at 4.0 GHz with an extremely strong signal. So strong in fact, we recommend you remove your 4.0 GHz RF amplifier stage for close-in tests or mis-align the antenna.

After the TX-432 is tuned up at 444.4444 MHz following the instructions that come with the kit, (**they** mean #47 pilot light bulb instead of #12), beg, borrow or steal an SWR bridge or Thruline Wattmeter from a nearby 2-way radio shop that will work properly in the 3/4 meter (432 MHz) ham band. Plug it in between the TX-432 and your neatly constructed multiplier/horn antenna. The only tuning necessary is to adjust the (schematic indicated) multiplier's (C2 and C3) trimmer capacitors for minimum SWR reading. They will interact somewhat, but with patience you should be able to get the forward SWR down to the 1.1 to 1.5 ballpark. At this point we strongly suggest you reduce the TX-432's 444.4444 MHz power output to **less than** 1/2 watt by inserting a 5 or 10 ohm 1/2 watt resistor in place of (schematic indicated) R11.

Now, move the assembly, battery and all, about 50 feet away from your 4 GHz antenna. Both antennas should be pointing at each other. Tune the 4 GHz receiver's local oscillator to whatever the specs call for to receive 4 GHz. "Swish it about a bit," and **there** is your weak signal source about 40 dB over S-9 plus. That's all there is to it. If you have an S-meter on the 4 GHz receiver, by all means peak-up **all** the TX-432 stages and multiplier for maximum output.

NEXT MONTH

We will cover using the North star, Polaris, and a homebrew transit made from a camera tripod to align your 4 GHz antenna on whatever TV satellite you wish...using of course, the 4 GHz crystal-controlled weak signal source we built this month for final alignment.

APPENDIX

Poly Paks, P. O. Box 942, South Lynnfield, MA 01940
VHF Engineering, 1783 W. 32nd Place, Hialeah, FL 33012 (305-887-3203)
G&G Electronics, 45-47 Warren St., New York, NY 10007

RICHCRAFT ENGINEERING LTD.

...offers you a computer generated printout for antenna azimuth and elevation pointing from your receiving site to all major geostationary satellites capable of being received in North America. This provides you with a basis for locating the following satellites: SATCOM F1, F2, and, WESTAR I, II and III, and, COMSTAR I, II and III, and, ANIK III and B, and, Ghorizont, and, STATSIONAR 4. Provide them with your geographic coordinates (longitude and latitude to within 10 minutes, taken from Road Atlas if no other source is available) plus $5.00 to handle shipping and handling and write to Richcraft Engineering Ltd., Drawer 1065, Chautauqua, New York 14722 (716-753-2654).

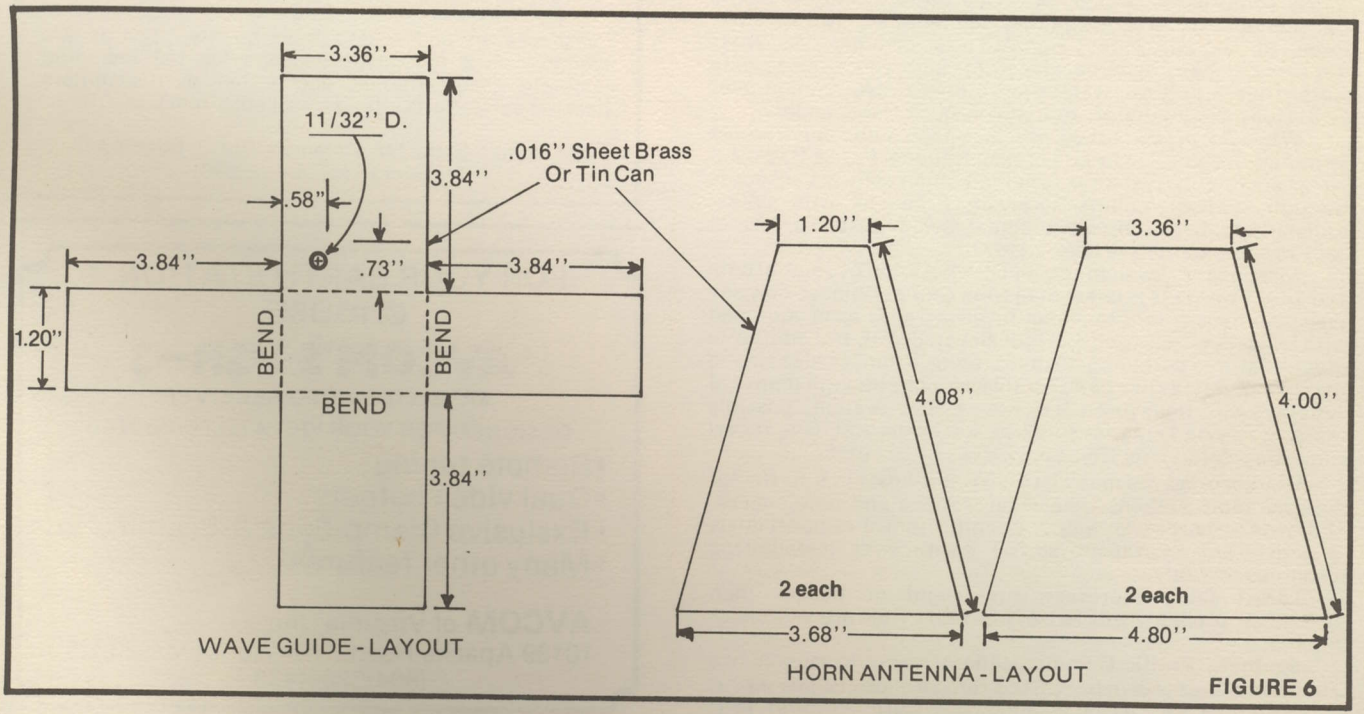


FIGURE 6

TECHNICAL NEWS NOTES

COMSAT LABS planning to demonstrate a five meter (27 feet wide by 16 feet high) TORUS antenna to cable operators in May in Dallas. Price to be in $30,000 range. TORUS is similar to Swan Spherical but this particular version can only scan 20 degrees of orbit belt. With FI at 135 degrees and FII at 119 degrees that is adequate for present cable uses.

OAK COMMUNICATIONS has conducted tests of new satellite scrambling system with assistance of Western Union utilizing WU's Lake Geneva, Wisconsin uplink site. Nobody wants to talk about the system, what it costs or on what principle it works; only stating ''tests were successful''. Oak is substantial supplier of cable security systems for pay cable and primary supplier of STV scrambler systems for over the air pay.

Harris Communications is expected to announce full line of small aperture receive terminals shortly with early marketing interest directed at small audio-only receive terminals. Don't be surprised if they also pop up in video field.

Russians have launched 46th Molniya satellite with typical 62.8 degree inclined orbit, 40,830 apogee and 478 perigee in a 12 hour and 17 minute cycle. During 1979 Russians launched 86 satellites (roughly one every four days!) while U.S. managed to get 15 off the ground.

RCA has not given up with two-for-one video system which compresses a pair of video signals into a single transponder. Several techniques for jamming two or even three (if digital) video signals into common 36 MHz transponder have been developed through years; all to date suffer from 3 to 5 dB system performance degradation over single fully-modulated video signal through transponder.

While AP predicts they will have 1600 audio only receive terminals in operation by end of 1980 National Public Radio 4.5 meter audio-only system is running behind contract schedule through supplier Collins/Rockwell. Problems with uplink transmitters, below threshold signal levels in Alaska, lack of backup equipment have been cited.

Marriage of development of DOMSAT for TV/audio/data and local TV outlets is latest plan from China. Chinese now say they plan 'tens of thousands' of receiving sites each equipped with typically 50 watt and 150 foot elevated VHF transmitter to cover local area perhaps 5-10 miles radius. Chinese also saying they prefer the 12 GHz band for this service although many US suppliers still believe an 'interim' 4 GHz system, possibly utilizing off-shelf Hughes satellite, will come first. One report suggests orbit spot for Chinese bird will be 92° east.

UPI now sees 'as many as 3,700' terminals in 6 to 10 foot class for radio stations, television stations and newspapers. Audio/data terminals being bought from Farinon/Harris ranging from $4,200 to $8,200 each. First installations scheduled this July.

Latest shuttle forecast; first flight no sooner than November; probably will be early in 1981. Tiles are still major problem.

Southern Pacific Communications wants to launch two C band satellites of own but US has run out of orbit spots if FCC grants Hughes permission to launch (see **CSD** February). FCC undecided how to handle excess of requests for last US domestic orbit spots (75 and 79 degrees west); agency feels it may have to seriously consider reducing orbit spacings to 3 degrees from present 4-5.

BIRKILL CATJ CORRECTION

Steve Birkill, who continues to provide a satellite technology column to **CATJ** magazine (which Coop started in 1974), suffered an unfortunate mixup in schematic-component layout drawing in the December issue of **CATJ**. The circuit describes a single stage GAT-5 (Plessey) 1.5 dB noise figure range LNA developed by Birkill and supported by a circuit board which his Real-World Technology makes available.

The diagram (3) appearing on page 50 of **CATJ** for December shows a pair of holes in the circuit board through which gate and drain bias is brought to the GAT-5 device. Birkill warns that the diagram was incorrectly reproduced by **CATJ**; that the hole nomenclatured at the bottom of the diagram as carrying drain bias from ''C5,D2 and M1...'' should actually read ''**carrying gate bias [variable] from C4, D1 and RV1**''. Similarly the **CATJ** nomenclature to the lower right that calls for (a hole carrying) ''gate bias (variable) from C4, D1 and RV1...'' should actually read ''**carrying drain bias + 5V from C5, D2 and M1...**''. As Steve warns failure to provide the proper bias to the proper points on the GAT-5 could easily destroy a (U.S. priced) $225 transistor in one unpleasant puff.

As noted Birkill's RWT does have a quality circuit board for this first-LNA-stage and with each circuit board is a correct set of instructions for construction and use of the LNA. Plessey devices remain quite expensive in the USA although there have been some indications of late that they may become more competitive shortly.

COOP'S COMMENT ON PROGRAMMING

BRINGING COMSAT'S BIRDS TO ROOST

On this page in February we raised the spectre of satellite-hype and in particular questioned the blantantly premature announcements by COMSAT and SEARS that the duo would be marketing home (11/12 GHz) satellite terminals "by 1983 or 4". Let's see where all of this smoke has led us in the intervening month.

COMSAT has been forecasting that they would 'hit the FCC' with a full blown description of their proposed direct broadcasting system around mid-March. They have engaged former FCC Chairman Richard Wiley, now in private law practice in Washington, to draft or supervise the FCC proposal. That sounds impressive.

But their announcements have begun to draw fire. Some of that fire is much more impressive than the smoke they have been wisping about. For example:

1) **The FCC has announced** they are immediately beginning internal research aimed at formulating an FCC 'white' or 'options' paper on the whole question of direct broadcasting satellites. Internal sources within the FCC say that any proposals submitted to them prior to the completion of that option paper will simply collect dust until the paper is done, and then after it is done, until a decision is made by the FCC on the direction the agency will allow direct satellite broadcasting to move. How long will this take? Well, they expect drafting the options paper to take nine months (or more) and then how long will a decision take after that? Assuming a Rule Making Proposal, time for public comment, and then finally a decision we'd not expect a formal FCC decision until at least 1982.
2) **House Communications Subcommittee Chairman** Lionel Van Deerlin has announced the wishes to hold formal hearings in March on the 'international and domestic activities of COMSAT'. Van Deerlin staffers note "COMSAT is a creature of Congress so Congress has a responsibility to check on it from time to time". What prompted this sudden decision to hold hearings on such short notice? "Direct broadcasting satellites (as proposed by COMSAT) are a vital interest of Congressman Van Deerlin...". COMSAT is attempting to get the hearings postponed.
3) **ITT, RCA and Western Union** have challenged a contract granted by the U.S. Defense Department to COMSAT for earth stations at military bases in Hawaii and on Guam. It is alleged that COMSAT used its monoply position (which was originally authorized by Congress in 1962) to win the contract.
4) **COMSAT**, meanwhile, **has announced it plans** to market a 5 meter TORUS antenna (that's the antenna that looks like a Swan Spherical) to CATV systems and word out is they plan to display it to the cable people in Dallas in May.
5) **The broadcasters**, represented through the powerful National Association of Broadcasters, are starting to act nervous over the COMSAT proposal. Said NAB spokesman Jack Harris recently "...(approval of) this system would likely be fatal to local station operation...".
6) **The NAB Board meanwhile** said late in January "(this COMSAT proposal) cannot be authorized by the FCC unless Congress first approves this...non-local transmission and determines the conditions...under which it can become operational. (Direct satellite TV) is inconsistent with the (established) system of local TV...provided by the 1934 Communications Act".
7) **The Corporation for Public Broadcasting** (CPB) which operates the PBS network approves of some of what COMSAT is proposing and hopes to benefit by being one of the services offered by COMSAT on a pay-to-view basis. Why is CPB interested? "Direct access to the home on a pay basis...holds some promise as one funding source for CPB (PBS)...".

Lots of smoke. But no fire yet. Former NTIA deputy director Paul Bortz, now a consultant in communication areas and still one of the best minds in the industry, sums it all up very nicely. States Paul "**COMSAT's predicted time frame** (1983-4) **is at best very unrealistic**". Bortz predicts, as do we, that the COMSAT proposal will be tied up in Congressional and regulatory agency hassles for years to come. At the very least the USA must await the outcome of the 1983 hemispheric conference on 12 GHz orbit slots (a continuation of WARC 79) before we even know how many 12 GHz orbit slots this nation will receive. More likely, it will be 1985 before that important determination is made. And Bortz notes "After that, the equipment will have to be funded, designed and built". Bortz suggests early 1990's for the start of such a system. We suggest he's much closer to the truth than Sears and Comsat with their 1983-4 time frame announcement.

What does all of this mean? Simply two things. COMSAT has a rough, long road ahead of it with this proposal. And the second? **For this decade at least** the present in-place 4 GHz 'C' band service will be with us as our dominant service.

CSD PROGRAMMING

COOP'S SATELLITE DIGEST (Programming Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Programming and Technology) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. or Canada add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing.

IF THIS IS HIXON -

IT MUST BE TUESDAY

During the mid part of this past December a pair of the **Paraframe** ET/3.66 (12 foot) antennas were scheduled for shipment to dealers in Colorado and British Columbia. Like virtually everyone else in this market we are learning what is good and not so good about our products (and the products of others!) on a daily basis. The opportunity to 'go with' a pair of antennas to be on hand when they were installed was too good to pass up largely because the trip offered me an occasion to see whether we could be building the antennas differently at the Paraframe plant in Illinois so that they would go together better (i.e. easier) or perform better.

The first stop was to be Kamloops, British Columbia where Paige Lycett, owner of Kamloops Communications was going to install a TVRO for a small remote community in northern BC. After some advice from Paige we shipped the ET/3.66 to a warehouse Paige utilizes in Bellingham, Washington. Again following Paige's instructions I had prepared a set of custom declaration forms detailing the contents of the shipment; one-each $450 (value) 'Solar Heat Reflector' (!).

At the Seattle airport Chris Sivertz (Chief TVRO Field Engineer for Paige) met me and packed into Paige's GMC Motorhome we headed for Vancouver where we had to clear some SCI LNAs and receivers through Canadian customs. During this bureaucratic interlude I practiced talking "Western Canadian" with phrases like 'oot' for out and 'wee' for little and so on; ending a sentence with an 'ay' ever now and again to show that I spoke their lingo.

The ET/3.66 was destined for a community called Hixon, some 40 miles south of Prince George. A total of 300 people live in Hixon and they have been forced to be content with 1-1/2 channels of TV up to now. As Chris throttled the GMC Motorhome up the Trans Canada Highway in the Frazer River Canyon he explained: "**Back east they make laws that impede rather than aid progress out here where everything is spread out and you consider yourself lucky to get even 1-1/2 channels of TV. Heck, when we put up our 10 foot experimental TVRO antenna on our roof in Kamloops the local CBC boys even came over to help out!**".

Chris continued "**We do lots of 2-way radio business and TV too; terrestrial TV that is. Or it was until we immersed ourselves in the satellite TV scene!**".

Chris and I passed through mile after mile of awesome scenery with the tape deck playing the 24 hour disco which Chris had taped off of a subcarrier on transponder 21. I had never heard such vibrant disco with such creative energy. It was a perfect match for the enthusiasm and energy of these western Canadians!

Finally we arrived at Kamloops; 60,000 people spread out in a large valley, a magnificent nighttime view after hours of lumber camps and truck stops. I spent the night at Paige's home and it was an 'event'. Janet's excellent cooking, plenty of good wine and such conversations. At one point I proposed a 'toast' to the western portions of both Canada and the United States seceding from their respective nations to form a dynamic new union. Paige countered that the wealth of western Canada was under constant attack from the red tape/regulation-gone-wild of their federal government! Bottoms up and another round of drinks...'**ay!**

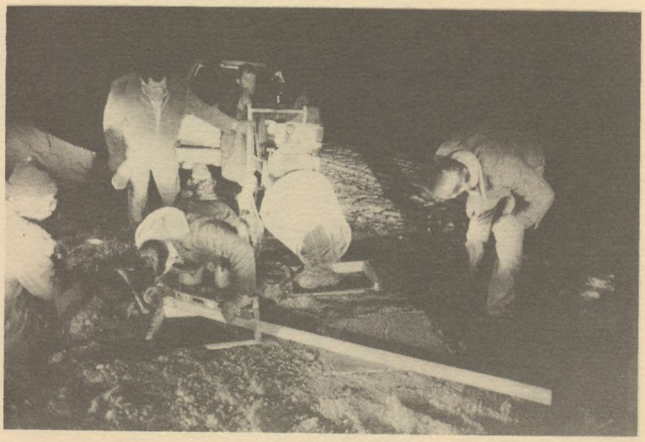
The next day we loaded the heavier parts of the ET/3.66 into a pickup, a four banger Toyota, that I would get a head start in. About five miles up the road (and 230 more to go) I discovered I had left the transponder 21 disco tapes behind. I checked the glove compartment; 'Twenty Favorite Songs to Dance To' with the Bob Campbell Band. Oh k-a-a-a-y...Turning north on BC Route 97 at Cache Creek and I was well on my way towards Hixon. Soon I hit mixed snow and sleet and I dropped the Toyota to 40 MPH. Promptly everything on the road began shooting by me...Kenworths hauling logs, 4 WD pickups, pickups without 4WD, TransAms and 'Vettes with straight pipes. And **everyone** had the big quartz-halogen driving lights fairly burning and blistering the paint off the rear of the Toyota.

Finally I arrived, pulled into Hixon and one of the Kamloops crew, Stan, pulled in behind me. I was promptly introduced to several of the town's citizens who had been instrumental in getting the TVRO funded and ordered. This is a most interesting community of 300; they do virtually everything as a 'family unit'. For example, nearly 85 couples from Hixon had chartered a flight to Hawaii in 1979. There is a real sense of community in everyone. Rolly Fuller, who runs an Imperial Esso station, was typical. He and his wife, Ethel, had left the suburban congestion of Vancouver to seek out a healthy rural environment to raise their sons.

The next day we put the ET/3.66 together in a quonset hut which one of the local residents utilizes

by
Jim Vines
Paraframe
Monee, Illinois

I THINK THIS STUFF IS FROZEN! The Canadians don't let a little thing like snow slow them down; they just adapt and charge ahead.



BOY WHAT FUN THIS IS! Pouring concrete in the middle of the Canadian night with snow on the ground for the ET/3.66 mount.

to maintain his Kenworth log hauler. I later learned he grosses $500 a day hauling logs with that rig. Everyone it seemed helped, from those who were making big money off the land to those who were there to teach the town's school children. At one time or another around two-thirds of Hixon's male population stopped by to lend a hand to the project. They all had one thing in common; they were frantic for lots of channels of clear TV and damn the federal bureaucrats who stood in their way and said they could not have it!

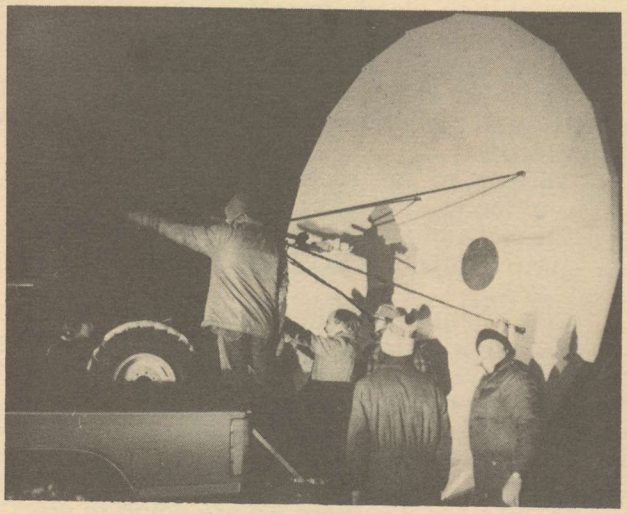
When the dish was completed we put it on a trailer and towed (as part of a long convoy of townspeople) three miles north on RT 97 and off down a side road. Then across a gully and into a pasture and onto the site where the town's TV translator 'connected' the homes to the outside world through a network of these old fashioned rebroadcasting devices. There was the el-az mounting waiting for the dish. The 4 WD's spaced out into a semicircle with their straight pipes rumbling and trained their headlights on the site. There we were on the side of a hill struggling mightily in Sunday's post-twilight to lift 600 pounds of antenna onto the mount. We did it, sweating and straining in the cold night air. On with the (SCI) LNA and the (Tony Bickel/ECA) feed. Check the distance from the throat to the feed and now aim for FI.

The monitor in the nearby Dodge Club Cab showed an image - almost **too** quickly. Also it was reversed in polarity; negative. Some more pointing and receiver fiddling and we had a beautiful noise-free picture. (In fact the C-N meter on the SCI receiver read 15!) Everyone gathered around with great glee and backslapping. Then it grew quiet with only an occasional awestruck utterance of the tremendous quality of the picture. Chris Sivertz was muttering too. "That's **too strong** for F1...".

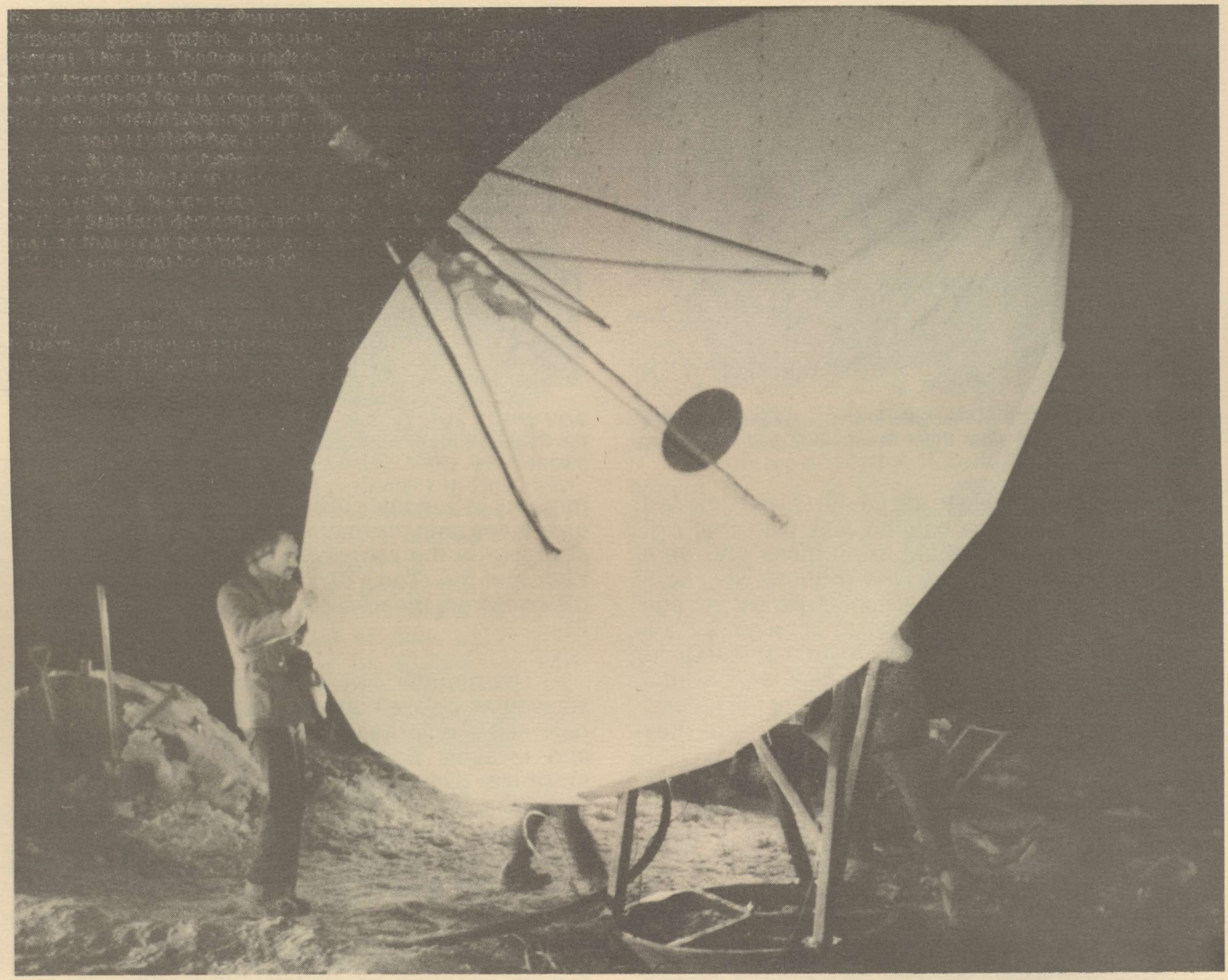
There was a break for a commercial. Odd...we kept watching and watching and then a transponder identification. "**KING-TV, Seattle...**".

Chris: "That's BC Tel...we are right in the

ASSEMBLED IN A QUONSET HUT this dish could say. The citizens of Hixon volunteered their time to help the community to get its shot at high quality TV from satellite.



I TELL 'YA - F1's OVER THERE! Well, it may have been there alright but so was BC Tel's terrestrial link.



A SHINEY WHITE SHIELD IN THE CANADIAN NIGHT - ET/3.66 begins the aiming process under guidance of Max Lentz.

middle of their bloody terrestrial microwave path feeding a cable system!''. More aiming and more KING-TV. So we closed up and went back to town.

There were several possibilities...Paige Lycett would later plot them out in what seemed like logical order:

1)Erect an RF screen to shield the TVRO antenna,

2)Erect a small six foot dish to receive Seattle's KING off of the BC Tel terrestrial microwave link,

3)Move the TVRO site to some other location.

I mentioned to Paige that taking the BC Tel feed of KING might not set kindly with BC Tel. Paige: ''**I phoned them up and told 'em. They got a wee bit uppity and so I said** See here - we didn't ask you to irradiate that pasture (where the translator and TVRO are located) with your bloody microwaves. So since it is there we are going to erect a 'passive collector' to get KING-5. **Take that and stuff it!**''.

The next morning I packed up and walked down the street to say goodbye at Fuller's Esso station. In the four days I spent at Hixon I had made many very good friends. Folks like Gordon Harris at who's house I stayed and Ken Vaughn who made the quonset hut available. All of the men who endured the cold, the runny noses and the cut knuckles to raise the dish on Sunday evening. In Hixon it's what you do or are willing to do that counts; not your title or how much money you have in the bank. It is quite a town and I am certain there are hundreds more like it spread throughout western Canada.

To get out of Canada's north I was to travel to Prince George. Chris warned me about the town: ''Prince George's a wide-open boomtown. I've heard tell of hookers tossing pebbles against the hotel windows to get business!''. Certainly didn't sound like upstate Illinois to me!

One of the Kamloops chaps drove me to Prince George and I took a third floor room at The Inn Of

The North. It would take a hefty arm to toss a pebble that high...still...

I settled onto the telephone to touch base with northern Illinois. I phoned my fabricator in Alsip (Ill.) to report that a key component in the Hixon dish had been dimensioned out of spec making proofing to + /-.050 inch RMS parabolic tolerance unnecessarily difficult. I was headed to Colorado next and that would also be a bear to do right. How about the dish for Sevierville, TN? Same problem. He agreed to correct the problem on the sixteen dishes in fabrication right away. That, I decided, was the way to do things. Go out into the real world and **look** for on-site problems. **Promptly** report them and see that the next people didn't have the problem.

Several more telephone calls and it was time for bed. Humm. No pebbles tonight.

The next day I was up early for a day of traveling. First Prince George to Calgary. I was headed for Paraframe dealer Warren Foster who lives at Grand Junction, Colorado. An unexpected treat of the flight was a two hour dogleg to the north to Dawson Creek on the way to Edmonton. At high noon in Dawson Creek the sun is barely 11 degrees above the horizon; a strange site to one who lives at latitude 40-41! Arriving at Edmondton later in the day a chap named Wally Baydala sat down next to me. He eyed my camera. ''A tourist 'ay?''

We chatted and I explained I was in the area on business.

''What sort of work do you do?'' he asked. I explained that I manufactured satellite TV antennas. ''**Eh! Tell me more!**'' Like every western Canadian I had met along the way Wally voiced the frustration and concern that the eastern (Canadian) bureaucrats impeded them from effectively utilizing their resources to generate a higher standard of living and wealth for all Canadians. Wally mused ''Why not make the pie bigger rather than trying to redistribute what's now available. The business climate out east is so bad that even the Royal Bank of Montreal is moving out here!''. And then he lowered the boom. ''**I'd like to have a TVRO at my house in the country outside of Calgary**.'' And you know something...I think he will, soon!

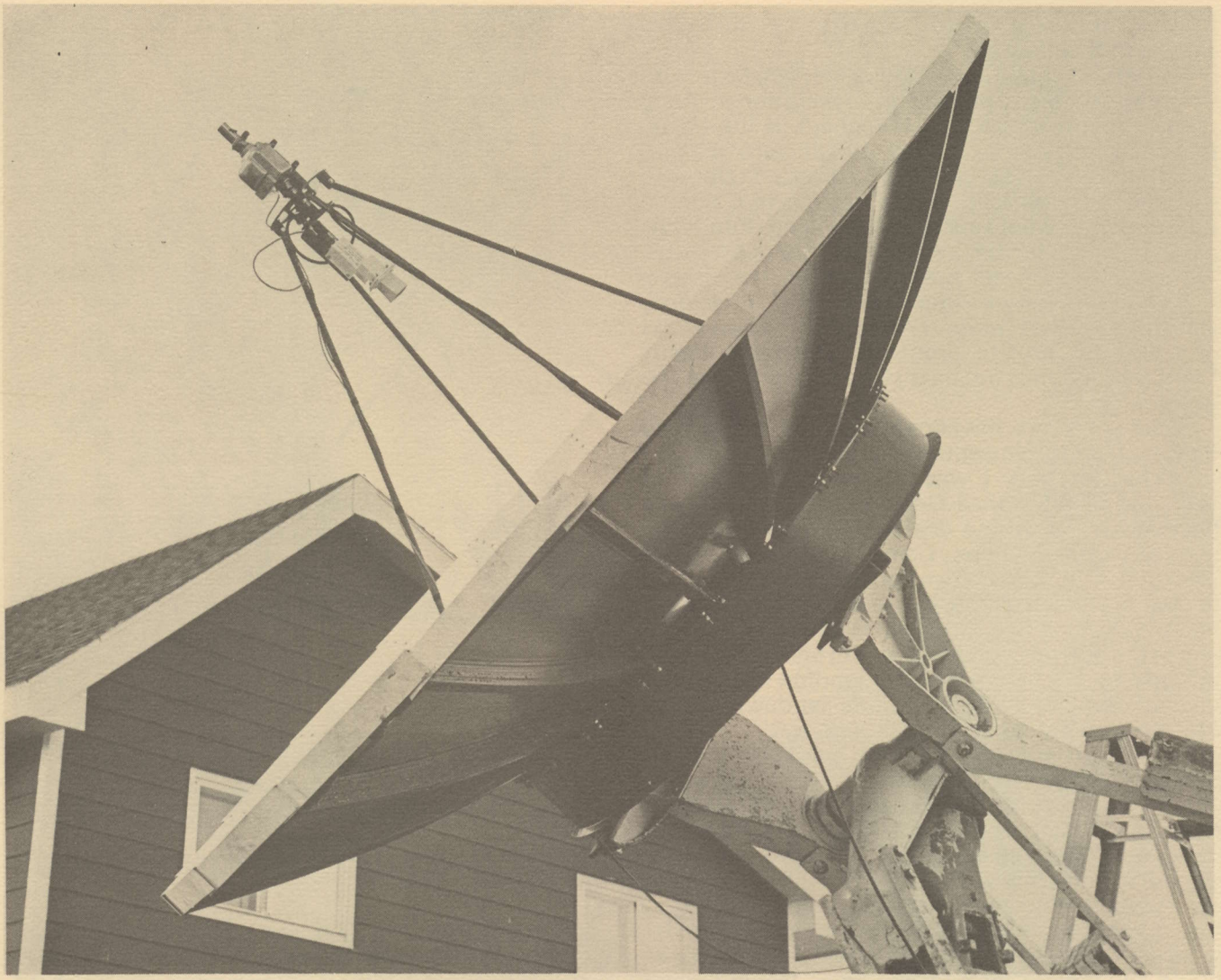
Arriving at Calgary I discovered the flight to Denver had been cancelled; a big snowstorm rolling down the Rockies was the culprit. But the next day when the storm had cleared there was a repeat of my earlier encounter.

Seated next to me: ''**Our real estate company in Calgary is doing a lot of developing in the Denver area. We would like to explore installing a TVRO for the homes we are building there**''. And once again, I think they will not only explore it but install one; soon. Furthermore I think **anyone** with enthusiasm can sell **one** brand new TVRO terminal **per day** simply by getting around and talking to people. The market, truly, is huge!

Near Collbran, Colorado at Warren Foster's Circle 4F Ranch we were to install an ET/3.66 on an equatorial mount which Warren had bought from California's Lance Ginner. These are super mounts! It had declination controls which make it a real one-adjustment system; with it we would be able to roller skate across the full geo-stationary orbit (and Molniya too if you wish - ed.). But first we had to get the antenna up. The mount was bolted to the top of an eight foot pier. It seems that early on last fall when Warren was shopping for equipment and advice somebody told him that F1 was just twenty degrees above his horizon. Later when Warren's computer printout arrived (***1**) he learned that from his location F1 was really 37 degrees up!

THE DAY AFTER - Paraframe ET/3.66 up and operational for the 300 people of Hixon, British Columbia.

The dish was finally installed atop the mount but not without problems. Warren's backhoe had a sticky hydraulic valve and as we were lifting the dish the backhoe dropped it two feet onto its edge! The last foot was pure free-fall and all 600 pounds of dish landed on the ends of the ribs and the lip of the aluminum skin. **Then** the backhoe dragged the antenna sideways another three feet with the face-down aluminum skin plowing the dirt and taking a nasty bending. It was a wonder the bottommost panel didn't tear off of the framework. **I now believe** our worst-angle windload survival rating of 125 MPH is **very** conservative.



50 CHANNELS OF TV FOR THE FOSTER RANCH - the ET/3.66 mounted on the equatorial mount obtained via Lance Ginner from Stanford's radio astronomy project makes a dandy package for sky searching. Slight cosmetic damage on near edge of antenna was result of backhoe dropping antenna to ground and then 'digging it in'!

The ET/3.66 performed perfectly. And the Foster household made a quantum leap courtesy of technology from one and one half TV channels (one Grand Junction plus a snowy translator, both via a pair of hilltop mounted yagis and 2,000 feet of CATV hardline plus various electronics) to over 50 channels. The **only** transponder on **any** bird that didn't look letter perfect was F1's transponder 9 (C-SPAN). But then the Heliax had not arrived at that point so we were driving 80 feet of RG-8/U coaxial cable (***2**). And this was with a 12 foot aperture ET/3.66, an SCI 120 degree LNA and Andy Hatfield's AVCOM PSR-3 receiver.

Putting myself in the shoes of the Foster household, I could imagine the emotional highs and lows they felt as the dish went together, fell unceremoniously just as it was being raised, and then hours later provided television like they had never seen before!

As I had anticipated after Hixon (BC) some of the antenna components for Warren were dimensioned out-of-spec so it was a real challenge to generate the reflective surface with the necessary precision. Thanks to the **Paraframe Proofing Template** we identified and corrected the problems. Thanks to being in the field with the installation, others could be corrected in advance.

Well, it was of course good to get home. Henry Turek of Oak Forest (IL) who 'came out of the woodwork' during SPTS '79 as an interested spectator had been busy while I was away; turning out enough ribs for another dozen ET/3.66 antennas. The fabricating company was fast solving another problem which I learned of while I was at Foster's in Colorado. An Illinois customer had paint peeling on one of our ET/4.85 (15.9 foot) antennas. We had stopped shipments until we could identify the source. This problem too was

resolved resulting in a vastly superior coating for all new antennas and a quick on-site fix for any already in the field with that problem.

Shortly after arriving home I used the telephone to guide Wayne Ayers down in Sevierville, TN in the assembly of his ET/3.66. His was the last unit built out of mechanical spec. His partner, John Tarwater, is a Grand National mechanic on the NASCAR circuit and with some minor telephone guidance they managed to assemble the dish and achieve an RMS accuracy of + /- oh-three-oh (!). Wayne was to bring some photos of his installation (which includes an SCI 120 degree LNA and another of AVCOM's PSR-3 receivers) down to Miami's SPTS '80. He also promised to bring his High School yearbook to prove to me that he went to school with Dolly Parton. Wayne probably learned close tolerance work while attending high school.

And this postscript. When I was at Warren Foster's I read in his **CSD** that Oliver Swan was in the hospital. And now what a shock to learn of his passing! I had looked forward to sharing my BC experience with this great man because Oliver, like Bucky Fuller, understood that technology unfettered by politics and red tape is mankind's ladder to a better and nobler existence.

Those of us who strive to advance satellite television technology to new levels are fellow travelers in a great and wonderful adverture; kindred souls who experience an empty feeling inside upon learning of the departure of our fellow traveler, Oliver Swan.

ANIK B as received at the Foster Ranch in Colorado on ET/3.66; picture off of Hitachi portable TV!

[*1] The satellite enthusiast can obtain his own computer chart of elevation angle and azimuth to the full geostationary horizon [the whole 'visible' belt from your location] from: Bill Johnston, 1808 Pomona Drive, Las Cruces, N.M. 88001. Enclose a large [9x12] envelope with 28 cents postage addressed to you and one dollar for IBM-360 printout.

[*2] Many transponders 'power down' during periods when no programming is being transmitted simply to save money [operating electricity of the uplink site and wear and tear on the uplink final transmitter amplifier]. Thus when C-SPAN and others are transmitting color bars you may notice heavy amounts of sparklies; due to their reducing the output of the transponder through the simple ploy of reducing the input. If you notice one or more transponders running color bars and they have sparklies, don't panic; chances are they have simply 'powered-down'.

PROGRAMMING PERMISSION & LICENSING

CANADIAN RIDDLE

Canada which led the world with geostationary DOMSATs (ANIK I) is as readers are aware again the leader with the operational launch of the first DOMSAT 12 GHz system. In another related area, domestic viewing of non-domestic (to them) satellite video signals is another area where it would also appear that Canada is leading the satellite world.

Canada's own domestic system has been faulted both from within and without by those who have decryed the underuse of the ANIK system in solving the needs of those Canadians who do not happen to live along the U.S. border. Canada led the world in cable television system engineering and innovation for several decades largely because U.S. signals are 'just over the horizon' from most of the major Canadian population centers (Vancouver, Toronto, Montreal, etc.). The lure of U.S. programming for Canadian veiwers has been considerable since the U.S. began broadcasting in the 1946-48 era and Canada's first television stations did not begin until 1952.

The first known and publicized Candian private terminal sprung up in the Canadian north in the summer of 1977. It lasted operational only a few days before an irate Canadian authority shut it down. From that small seed and plenty of press in Canada has grown a network of **still illegal** TVRO terminals which knowledgeable inside sources now estimate totals between 450 and 600. Very few if indeed any of these 'illegal' systems tune in the Canadian ANIK satellites; they exist because they are receiving U.S. programming (primarily from F1).

Many of these terminals are operated in some form of **cooperative community effort**; not unlike the Hixon, B.C. terminal Jim Vines writes of in this issue of **CSD**. That simply means that the government authorities are facing whole communities rather than isolated individuals when they seek to shut down the pirate systems. And as the Candian authorities have stated again and again, it woul d serve no purpose to shut down these terminals (in what many predict would be a literal bloodbath in some instances) as long as there are no Canadian programming alternatives for the terminals and the communities they serve.

Most of these terminals distribute the SATCOM F1 programs to homes in the area via either cable systems or via rebroadcast transmitters (in effect low power VHF translators). Both cable systems and VHF (or UHF) translators are licensed and governed by the CRTC/DOC; the twin arms of Canadian communications policy and law. Thus Canadian

communities operating illegal terminals are **also** often operating illegal cable and/or translators as well. Most such systems are well engineered, well funded, certainly well supported and they operate to professional standards.

In addition to those terminals operated for multi-family groups (i.e. communities of one sort or another) there are of course the true private terminals installed by individuals for their own pleasure. Most of the Canadian concern is with the **community systems** at the moment; not with the truly private (individual) systems.

Into this comes the Canadian Telesat system; the consortium of private (largely telephone company) industry and government which funds and operates the ANIK system. Telesat's latest achievement has been the operational status of the 12 GHz transponders on ANIK B (parked at 109 degrees west). There are six transponders in this service, each with 20 watts peak transmitter power and each occupying a 72 MHz wide channel (i.e. twice of the width of the 4 GHz channels). As Canada pioneered the 4 GHz domestic service, Canda is now pioneering the 12 GHz domestic service.

The ANIK B bird carries in addition to the six transponders on 12 GHz a total of 12 standard format (36 MHz wide) transponders on 4 GHz (downlink). The bird is configured so that because of primary power supply limitations only 12 total transponders (4 GHz and 12 GHz) may be transmitting at full output power at a time. Additionally, because of the heavier power load no more than 4 of the 12 GHz transponders may be utilized at a time.

The ANIK B 12 GHz capability is Canada's future; Candian authorities believe that they not only must demonstrate to the world Canada's technology achievements in this area (in order to produce a marketplace worldwide for Canada's 12 GHz electronics hardware) but also to curb the prairie-fire growth of **illegal 4 GHz terminals** now spreading throughout Canada. The key to bringing 4 GHz pirate terminals under control (at least where these terminals are located to serve whole communities) is to get a good selection of alternate television programming onto satellite (**on 12 GHz**); in this case Canadian programming for Canadians.

The grass-roots failure of the Canadian Northern Service (two English language channels and one French language channel), as it grew on ANIK III and has subsequently expanded to ANIK-B, to grab and hold the interest of Canadians living in the far north has been dramatic. The two English language channels are programmed as a **network feed**, as opposed to being a 'super station feed' and this has allowed the programming bureaucrats to re-arrange and select programming to suit what **they perceive** the needs of the northern Canadians must be. The service generally lacks feeling and it comes across as a stiff-upper-lip communications forum whereon the southern bureaucrats talk down to their northern rural country cousins. This was not to be a mistake the ANIK B service would re-make at 12 GHz.

The 12 GHz feed now on ANIK B presently carries the CBC Vancouver outlet (CBUT which is terrestrially on VHF channel 2) and the independent (CTV) network feed also serving Vancouver (CHAN). Thus the 12 GHz service now has a pair of 'super stations'; real, live **broadcast** feeds without the sticky fingers of government bureaucrats getting in there to mess around with programming selection and sequencing. The ANIK B feed on 12 GHz is presently configured so that CBUT and CHAN **share** transponder six. That means there are **two** 36 MHz wide video signals (with accompanying audio subcarriers) which operate in the 72 MHz bandwidth transponder. As we shall see this is important since it allows recovery of **both** with relatively simple receivers. Also on ANIK-B at the present time is the BCIT (British Columbia Institute of Technology) on transponder 5; a college level series of courses for educational purposes. This signal operates in the 1/2 transponder format as well. The only other video on the ANIK B 12 GHz service is occasional TCTS (Trans Canada Telephone System) testing.

It has been variously reported (including here in **CSD**) that the primary source for Candian receivers for this 12 GHz service is a Saskatchewan firm called SED. They have been under contract providing Telesat their 4 GHz receiving equipment for some years and until recently a ten-receiver-per month capability was about their limit. With the expansion to the 12 GHz service SED has grown but not dramatically.

SED, **we understand**, builds a downconverter/antenna package that consists of either 3 or 6 foot dishes (for 12 GHz) with buttonhook feeds, an LNA (specified at 4.5 dB noise figure which at 12 GHz is quite respectable) and a downconverter that has a 1,000 MHz (1 GHz) i.f. The cost of this package, which **ends at** 1 GHz, is reported to be in the $3,000 per terminal range (there have been reports of $500 terminals but this number is largely discounted as nothing more than a **projection** of what such downconverter/LNA/antenna packages **could be sold for** if there was sufficient volume).

SED quits at the 1 GHz downlink i.f. A second Canadian firm, Electrohome of Canada, picks it up there with a demodulator system that starts off with a 1 GHz input. The Electrohome demodulator has a tuneable AFC (automatic frequency control) system which allows it to be 'swung' **within** the 72 MHz wide channel to recapture **either** the CBUT **or** the

CANADIAN SATELLITE DIFFERENCES

ANIK B - Operates on 4 GHz and 11/12 GHz downlink. Operating power is 10 watts peak at 4 GHz and 20 watts peak at 12 GHz.

1) **Audio** - standard is 6.8 MHz subcarrier. Additional subcarriers are typically found on 6.17 and 5.41 MHz. The audio preemphasis utilized by ANIK is **not** compatible with the US DOMSAT audio totally. US audio is 15 kHz with 75 microsecond preemphasis. Canadian is 5 kHz and audio deviation is set against a standard of 50 kHz RMS fed by a +8 dBM test tone at 1 kHz. Instantaneous program peaks may exceed 160 kHz deviation.

   a) Audio channels are 'stacked' and to ensure that there is no 'cross talk' in the receiver a **5 kHz low-pass filter** must be installed in the audio system (this sounds like a constant background 'chatter' or tinkling of bells on a receiver that has the normal US audio bandwidth and preemphasis).

2) **Video** - The 4 GHz downlink frequencies are the same as other ANIK B and US DOMSAT transponders. All polarization is linear (horizontal). The 12 GHz transponders are also linear (horizontal) and they are assigned as follows:

   Transponder 1 = 11,740 MHz center frequency
   Transponder 2 = 11,820 MHz center frequency
   Transponder 3 = 11,900 MHz center frequency
   Transponder 4 = 11,980 MHz center frequency
   Transponder 5 = 12,060 MHz center frequency
   Transponder 6 = 12,140 MHz center frequency

Thus with the CBUT/CHAN split transponder format the center of the lower program service would be found at 12,120 MHz while the center of the upper program service would be found at 12,180 MHz.

CHAN video (plus subcarrier audio) independently. Because the actual modulated bandwidth of the 12 GHz signals is the same as the 4 GHz service signals (i.e. 36 MHz maximum), a standard DOMSAT video receiver will work as an i.f. for this service. A designer could create a downconverter that scoots the 12 GHz incoming signal down to some transponder in the 3.7 to 4.2 GHz range and then tune in the CBUT and CHAN feeds using a standard DOMSAT receiver on two adjacent (same polarization such as 2 and 4) dial positions.

The system is technically performing well. The basic differences between it and US DOMSAT signal sources is shown separately here. There are a couple, including the Candian audio system which differs quite markedly from the US DOMSAT audio system (Canadian audio is recoverable on a stock US DOMSAT receiver but it is not clean or crisp unless you make some audio demod modifications as outlined in the new **Washburn TVRO Receiver Manual**).

Underlying all of this new technology is the political importance of the system. Canadian authorities are determined to stop the pirate terminals now mushrooming in hundreds of Canadian communities. But to do this effectively they must be able to face the electorate squarely in the eye and say "**YES - there are viable alternatives NOW available via ANIK B**". By combining two super station feeds (CBUT plus CHAN) and throwing in the BCIT educational programming, they are most of the way to that point.

Several Canadian observers feel that had not the present Government lost its backing in Parliament the crack down would have begun already. They feel that as soon as new general elections have occurred and there is once again a Canadian leader and government in place, the crack down on **community owned and operated** pirate terminals will begin swiftly.

How might this work? Obviously the Canadian authorities inside of the CRC (Canadian Research Council; the group presently administering the Telesat and ANIK B service) are not about to give away their battle plans in advance. **However**, knowledgeable Canadian observers see this scenario unfolding:

1) First will come an anouncement telling all operators of illegal, private TVRO terminals now receiving (illegally) US programming to cease and desist. The announcement is expected to point up that through ANIK B viable Canadian alternatives now exist (i.e. CBUT and CHAN plus BCIT).
2) **Expecting a revolution**, a second announcement will tell those then-existing terminals that "upon reconsideration the CRC has decided that those 4 GHz terminals now operating illegally, receiving U.S. signals, may continue to operate," provided:
   a) They **also** install 12 GHz terminals to **add** CBUT and CHAN (plus possibly BCIT) to their systems, and,
   b) They immediately **cease carrying** any U.S. program sources other than one (or perhaps two at most) of the U.S. super station signals (i.e. selecting between WTBS, WOR, WGN and KTVU). **No**, they may **not** carry other U.S. cable feeds **such as** HBO, SHOWTIME, SPN and so on.
3) Having at that point stated their 'bottom line' the CRC/DOC/CRTC will then advise that these then-existing terminals will be grandfathered (i.e. allowed to continue operating), but that no **new** ones will be permitted. Furthermore, if the existing terminals do not (1)install 12 GHz ANIK B receivers, and, (2)cease reception and redistribution of non-broadcast U.S. signals (such as HBO et al) they will then face being shut down; **by force if necessary.**

Again this is a presumptive assessment of what several knowledgeable Canadian TVRO people see coming. Is that the end of the brief but spirited Candian pioneering experiment in across-the-border domestic satellite service? No, not quite. The CRC people recognize that as long as there is a proliferation of hardware capable of receiving these US 4 GHz signals that some problems will continue. The **individual homes** engaging in private reception are **not** an immediate concern to the CRC/DOC/CRTC. The community fed systems are. So down the road, in the 1981-82 timeframe, when ANIK-C is launched (it will have 16 11/12 GHz downlink range transponders each 54 MHz wide) the present plan is for the Canadians to totally abandon the 4 GHz service for video. All Canadian satellite video will eventually, we are told, end up in the 11/12 GHz service region. They rationalize that they can never totally 'stamp out' illegal 4 GHz terminals 'pirating' US signals from across the border but they can shift Canadian technology to the 11/12 GHz band where eventually the 4 GHz equipment now available will either dry up or become a bootleg item for across-the-border smuggling. In the former case they will say 'good riddance' and in the latter case it will become more easily controlled. At one point in time in the not too

distant past it was illegal in Canada to even **own** (as in possess) a 4 GHz TVRO receiver, LNA or antenna!

Canada is wrestling with a considerable problem. They are looking for solutions which satisfy the people who until now have been deprived of quality real-time television. They feel the solutions must be implemented in a way that encourages retention of the Canadian national identity without simply allowing the overwash of American television to socially convert Canada into a 51st state. At the same time there is an intense desire to establish Canada as a worldwide technology and hardware source for the coming age of satellite communications. It is a difficult problem to say the least.

SPTS '80 REPORT
REAL WORLD
MARKETING BEGINS

After months of waiting and guarded preliminary announcements the private terminal marketing effort got the big shot in the arm it most needed during the Satellite Private Terminal Seminar held in Miami February 5th - 7th. **CSD** estimates that no fewer than 750 brand new private terminals will be installed as a direct result of orders placed for equipment during the Seminar with a wholesale equipment value in excess of $2,500,000. In addition to this brisk activity at the show itself a number of substantial 'large-quantity' buyers emerged during SPTS asking for quotations for hardware that will total perhaps another $5,000,000 in wholesale level sales during the next six months.

Some of the estimated statistics are mind boggling. We talked with the exhibitors before, during and after the Seminar to keep tabs of just how the purchasing activity was developing. Here are some of the highlights:

One antenna manufacturer wrote on-the-spot orders for more than 200 units while a second antenna exhibitor has been asked to bid on 1,000 antennas to a single buyer.

An LNA supplier wrote on-the-spot orders totaling in excess of $100,000.

A receiver supplier wrote orders for more than 250 units and reports his firm is developing bids for an additional 450 units as a direct result of SPTS.

The trend was definitely towards relatively large orders from firms now entering the private TVRO field intending to distribute in their local areas completely installed terminals. Antennas, receivers and LNAs being ordered in the 25-quantity range was a common-place event.

The interest in large quantity orders came to SPTS from throughout the world. Several Canadian distributors were chasing both 4 GHz and 12 GHz terminals. It turned out that one exhibitor can now supply 12 GHz terminals produced in Japan for around $1200 each [1] in small quantities. And there was every indication that Japanese produced 12 GHz terminals will cost about half that much as soon as quantity production begins (possibly before the end of this year). Several attendees noted that at least for the moment the US and Canadian suppliers should be relieved that the Japanese electronics industry has **not** opted to enter the 4 GHz marketplace with 12 GHz terminal prices like these!

An attendee from the South Pacific made waves of his own by shopping for an initial quantity of 1,000 terminals (4 GHz) for use in the Pacific Basin. The firm he represented distributes videotaped programs to approximately 7,500 VCR machines scattered from Australia north and northeast to the equator. His concept was straight forward; he intends to lease INTELSAT (Pacific) time each day to feed television programming back into the area utilizing either a spot beam (**if** INTELSAT will agree to lease him one) or in the worst case a hemispheric beam. He will program the daily feed and lease/rent/sell the terminals throughout the area. Anyone who is already distributing daily television programming to some 7,500 VCR machines scattered over thousands of miles of Pacific Ocean has got to find satellite transmission a far less expensive technique and it holds out the hope that at some point in time he could also add direct live events to the system as well.

ANDY HATFIELD with plenty of helpful hands tweeks and adjusts on his AVCOM receiver during the INTELSAT search operation.

INTELSAT has always seemed to be beyond the receiving system capabilities of 'low cost' private terminals. SPTS '80/Miami will be remembered as the turning point for that assumption. Bob Cooper had arranged for England's Steve Birkill to airship a Hybrid Mode feed (see **CSD** for February, Technical Section) with which Jim Vine's 15.9 foot ET/4.85 **Paraframe** antenna would go looking for the Russian Molniya (inclined orbit) and Statsionar (geostationary) birds. We picked out the Russian birds because we felt their **estimated** 29 dBw EIRP contours were 'do-able' even on a 16 foot antenna. Late in the afternoon on February 6th an ad-hoc group of enthusiasts retired to the parking lot to retro-fit the ET/4.85 antenna with the Birkill feed. Alas, it could not be found. After re-checking the Birkill feed on a linear polarized signal

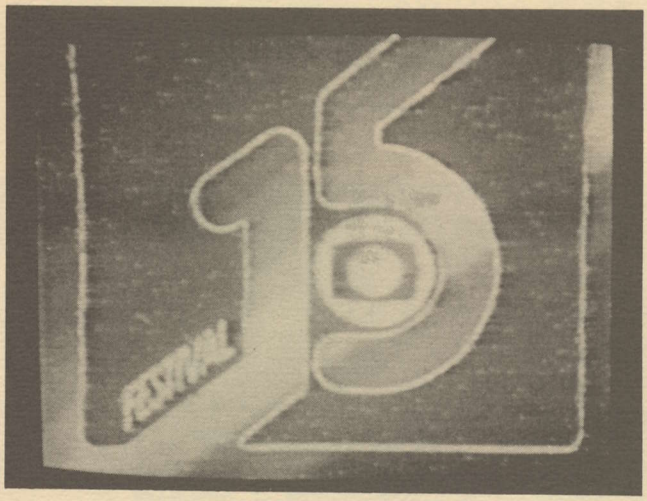
(WESTAR I) the decision was made to swap out the special feed for the standard linear feed and try again. While this was being done Gene Martin and Ted Spillar of **Star Antenna** (Lafayette, LA) brought their 4 meter polar mounted antenna on around to the east. Under the direction of Andy Hatfield who provided an **AVCOM** receiver for the test a picture was found far off in the eastern quadrant. After tweeking up the antenna, numbers and letters approximately 1 inch high on the

72 INCHES TO THE FEED - Birkill Hybird Mode feed being adjusted to position on Paraframe ET/4.85 parabolic.

19 inch monitor could be read and the signal was identified as a BrasilSat feed from Sao Paulo (Brazil)! Subsequent checking revealed the **Star** 4 meter antenna was homed in on INTELSAT's IVA-FI bird at 24.5 degrees west and the Brazilian station was operating in a 26 dBw hemispheric beam pattern feeding programming to remote Brazilian terrestrial TV stations.

And then the fun really began. While the **Paraframe** crew brought their ET/4.85 antenna around to the same heading Paul Shuch appeared with a prototype of his 'next generation' TVRO receiver under his arm. Over the next hour under Shuch's and Hatfield's direction additional receivers from **AB Elecronics/VHF Engineering** and **International Crystal Manufacturing Co.** (ICM) appeared on the table and all were directly compared for performance on the weak INTELSAT signal. The photos included here are of the Sao Paulo/ INTELSAT reception utilizing the prototype Shuch receiver.

During the course of the trials Andy Hatfield found that this particular INTELSAT feed (Andy reports it was located around transponder 20 in the DOMSAT world) was carrying subcarrier audio in the 6.55 MHz region. Several sporting events (including a soccer game), news, a feature film and various short features were watched and enjoyed by a crowd of approximately 100 people.



SAO PAULO VIA INTELSAT - utilizing power meter provided by Andy Hatfield we measured peak CNR's in the 5.5 region on linear polarized feed and ET/4.85 antenna. Just graduating to the hybrid mode feed would have bought us 3 more dB!

The ''news'' that INTELSAT reception was practical with antennas as small as 15.9 feet (utilizing standard DOMSAT receivers and a 120 degree LNA) spread rapidly on Thursday morning. Bob Behar's **AB Electroncis** had it piped into their exhibit booth by 10 AM. The timing was perfect because a 9 AM session on Thursday was titled ''Reception Problems and Opportunities in the Caribbean, Central and South America''. More than 75 attendees from this region of the world had been struggling with the special problems created by rapidly diminishing signal levels from US DOMSAT birds in their sector of the hemisphere. Even in the middle Caribbean 8 meter antennas looked like the minimum size that would produce sparklie-free pictures from DOMSAT with 10 meter antennas required in extreme southern Central America. For northern South America the DOMSAT signals looked marginal even with ten meter antennas. Some calculations indicated that **with** the Hemispheric pattern signals from INTELSAT (26 dBw) a combination of a 6 (or 7) meter antenna, 120 degree LNA plus a good quality phase lock loop demodulator would produce good quality (if not perfect) signals. Attendees from such diverse locations as Ascension Island and South Africa were equally joyed to see the test results since it placed them in a position where they too could enjoy satellite TV reception.

The events of the February 6th tests were videotaped by both Chuck Azar's **INSTANT REPLAY** crew and attendee John Fulmer. Excerpts from these tapes are now running on Coop's

Thursday **Satellite Magazine Program** (transponder 21, 12 noon eastern) and a special INSTANT REPLAY videotape feature on this exciting new application of low cost private terminals will be available shortly [2].

Several sessions during SPTS '80/Miami were devoted to the crucial question of programming access and 'terminal justification'. One especially important session was conducted by Bill Luxom, President of the **American Educational Television Network** (AETV). This firm will begin transmitting (transponder 10 and 12) very specialized on-going (or continuing) education programming around the first of June; programming that allows professional people such as doctors, real estate brokers, nurses and so on to maintain their annual quotas of 'education'. Luxom pointed out that many states are now requiring their professional people to 'stay current' as a condition for their 'licensing' to practice. His AETV program allows a professional person to take fully accredited courses (with tests and study packages) in his own home or office and to satisfy the state requirements or in some instances national requirements. Luxom also noted that his firm will be contracting-out many thousands of terminal installations in the years ahead and he appealed to the attendees who were entering the terminal sales and installation business to stay in touch with him. You can contact AETV at 400 Golden Shore (Suite 302), Long Beach, CA 90802 (213/590-5691).

In the closing session on Thursday the attendees discussed forming an international 'trade association' of

NOT BANNED IN BRAZIL - cigarette advertising plus the usual assortment of international products [GM Brasil, Coke, etc] was seen. Some of their commercial periods are as long as our program periods!

THE BIG MOMENT - an anxious crowd numering perhaps 100 strong at the peak witnesses the first public INTELSAT reception on a small terminal. That's the STAR 4 meter antenna that found the first INTELSAT reception in the background; we were so close to threshold we had to constantly ask people to move back away from the front of the antenna to keep absorbtion losses to a minimum!

private terminal owners, operators, installers and manufacturers. A formation committee was created, headed up by **Eugene Martin** of **Star Antenna Manufacturing Co.** (1575 Antiqua Drive, Lafayette, LA 70503) and all of the attendees at SPTS '80/Miami will be receiving a letter shortly from Gene outlining the initial goals and proposals of the group. **CSD** urges anyone who was not in attendance to contact Gene Martin regarding this new association; if you are involved in low cost satellite terminals in any way **you need to be a part of this!**

As the companion report appearing in the Technical Section of **CSD** reports, this SPTS was a very exciting event. The next SPTS will be held late in June (or early in July; exact dates will be announced in mid-March) in the southern portion of the San Francisco Bay Area. See you there!!!

[1]If you are interested in learning more about the newly available Japanese 12 GHz terminals CSD suggests you contact James M. Janky at VITA-LINK [701 Welch Road, Suite 225, Palo Alto, CA 94304]; [415/497-4521].

[2]To inquire about the special videotape reports available documenting SPTS '80, contact INSTANT REPLAY at 2980 McFarlane Rd., Coconut Grove, FL 33133; [305/448-7088].

PROGRAMMING CORRESPONDENCE

A TRUCK LOAD IN CRANE LAKE

Recently a friend of mine was watching a TV program that originated in Winnipeg. They were interviewing a man who maintained that it was possible to build an antenna that will pick up TV signals directly from a satelite at a cost of $500. A recent **TV GUIDE** article speaks to this subject and indicates that firms in Canada and Japan are now building and selling such terminals for $300 to $400. I have a friend who is an electronics design engineer. He would certainly be capable of building such a device if there were plans available. Do you have such plans that can be purchased?

We are in a remote area of Minnesota and TV reception is lousy at best. If I had a truckload of such a device in Crane Lake they would be sold in 5 minutes.

John P. Bodkin
Crane Lake, MN 55725

You can build **an antenna for $300 or even less. To that you have to add the LNA + receiver package which if one follows Robert Coleman's approach can be done for perhaps $500. The Coleman TD-2 Conversion Manual** (available from STT for $30) **tells how to do it. The Canadian and Japanese $300 to $400 terminals are for the** experimental **11/12 GHz satellites that provide spot-beam coverage in both countries. In Crane Lake you could get excellent reception from the ANIK-B 11/12 GHz service** (being almost into Canada) **but you'd probably be more at home with 4 GHz service from either ANIK-B or from SATCOM** (or both).

There are hundreds (if indeed not thousands) **of Crane Lakes all over America. Not many people live in Crane Lakes so we don't realize how for more than 25% of the land mass area of the U.S. there is not even** ONE **television channel available off air. TV stations naturally get built where people concentrate. Crane Lake is not one of those spots. A study commissioned by the U.S. Senate back in 1975 reported more than 1,000,000 U.S. homes still have** NO **television reception.** Crane Lakes arise

CHRISTMAS BIRDS

I am intrigued about the possibility of receiving satellite TV here on Christmas Island, located in the Indian Ocean some 250 miles southwest of Indonesia. We have two primary problems here; our lack of knowledge of what satellites are available to us, and the use of PAL 'D' (Australian) receivers and video. What can we expect here and how will it work?

G. T. Presley
Christmas Island
Indian Ocean

The 'easiest' satellite family for you to locate on Christmas Island will be the Palapa series of birds with Palapa I at 83 degrees east and II at 77 degrees east. Palapa is operated by the Indonesian Pertel and our EIRP map file shows it to have a 31.5 dBw footprint on your island. That puts you in 'tall cotton' even with something like a 12 footer with a 120 LNA. Indonesia operates the same PAL standards as Australia (our sources call it PAL 'B' rather than D). **Other birds within shot would include INTELSATS over the Indian Ocean, the Pacific, various Russian birds and a fair number of experimental birds including a new Indian bird due to go up this summer.**

The various video standards in use in the world today are at best confusing to those of us who were brought up on NTSC **color. Sony markets a standards-switchable color monitor** (PVM-1850PS) **which allows you to switch between PAL/SECAM and modified NTSC. That's one approach to being able to resolve** (in color) **anything the birds can throw at you** (this 18'' monitor lists for around $1500 and can usually be bought with discounts for around $1300). **The day is coming where anyone seriously 'into satellites' will want to have a switchable monitor system operational. We'd like to hear from a reader who knows enough about what is involved in all of this to prepare a good report for publication here in CSD.**

EVERYONE WANTS ON THE BIRD

I represent a group of video-oriented Memphians involved in public access narrow-casting on Memphis CATV channel 32. I enjoy your weekly program on the Satellite Program Network which is carried on the Memphis CATV system on channel 25. We are interested in producing a program for public access on the concept of home satellite receiving systems. Can you help us gather the data to prepare such a program?

Randall Lyon
Televista Projects, Inc.
Memphis, TN 38107

Our SPN program this past few months has not had the attention we wish it had received primarily because of the press of other activities, and, because our production arrangements with a local university have been something less than ideal. As more and more satellite enthusiasts either get tuned in via SPN or develop their own abilities to receive the program directly we will be spending more time seeing that the content (and production quality) **of the weekly SATELLITE MAGAZINE show is brought back up to a high level again. Those who attended SPTS '80 in Miami will enjoy reliving some of the highlights of the Seminar during the March-April period.**

UP ABOVE DOWN UNDER

I read with interest a recent article in the July 1979 issue of **QST** describing what a couple of enthusiastic hams (G8AKQ and K4AWB) have been doing with low cost satellite TV reception equipment and experiments. This has really spurted my enthusiasm and I would very much like to be able to create a similar system here. I have ascertained that there is a Pacific INTELSAT satellite located pretty well overhead handling Pacific traffic with television operating on channel 12 in the 3.7

to 4.2 GHz band. Unfortunately here on New Herbrides ther does not exist such a thing as a surplus dish and in this little country I would have to have a go at making one. Could you possibly advise of somebody capable of supplying a low noise preamp and downconverter to say 500 MHz; and what the cost would be? My knowledge of microwave technology is virtually non-existent so please forgive my ignorance. I am willing to learn however and any groups of experimenters that you could recommend would be greatly appreciated here.

Peter Duddy (YJ8PD)
Port Vila
New Herbrides, Oceania

We recently helped a chap in New Guinea get his terminal started and there is now a small but growing group of enthusiasts scattered throughout the Pacific. There are two **INTELSAT birds sitting above approximately 180 degrees west. Like all INTELSATs they carry 'occasional traffic'. However, in the near future the Australians will start operating a fulltime** (probably 12-15 hours per day) **transponder on one of these INTELSAT birds which will be used as a relay for Australian TV service on a regular, scheduled basis. One source** (which we cannot confirm at this time) **suggests that this Australian** (ABC) **programming will have its aural subcarrier with the video on the same transponder as a way of making the Australian receive terminals** (about 50 initially) **less complex.This Australian use of INTELSAT is preparatory to a pair of Australian satellites that will possibly go into operation around 1984. In New Herbrides you might even get some useable signal from the Indonesian Palapa birds** (at 77 and 83 east) **as well as one or more of the Russian birds. Truly, it is difficult to escape to a spot where you cannot find satellite TV available these days!**

WALL CHARTS STILL AVAILABLE

Would it be possible for us to obtain two copies of the Worldwide Communication Satellites Data Chart of Facts, Figures and Operational Standards? We have one copy and have found it to be very informative.

Jim McDonough
Product Manager
VARIAN
Santa Clara, Ca 95050

The STT Wall Chart is in its umpteenth reprinting. Price is $10.00 per chart. The chart measures 22 by 35 inches, printed both sides [that's why many people order a pair], four colors and is loaded with the locations and operational data for all of the world's geostationary [TV carriage] **satellite systems. Write STT,. P. O. Box G, Arcadia, OK 73007. Send money with order; no billing.**

YOU'RE WELCOME

I am presently gathering parts and information for my satellite TVRO system. Most of what I have accumulated has been through Satellite Television Technology publications to which I will owe my sustem's success.

Upon completion of my system I would to be able to tune in **Coop's Satellite Magazine Program** on transponder 21. I hereby make a request for written permission to receive my first satellite TV signal, your one hour Satellite Magazine weekly show. Thank you for everything.

Henry R. Hobson
Harwick, PA 15049

I would like to obtain your permission to receive your weekly program **"Coop's Satellite Magazine"** via satellite.

Dr. Dean L. Cook
South Bend, IN 46614

STT continues to grant written permission to anyone who writes and requests same. Under FCC rules you no longer need any type of FCC permission or license to construct **a TVRO terminal for your own private use. You** DO **need the written permission of at least** one **programmer or program source on the satellite and recent issues of** CSD **have listed such sources** (see November 1979 issue)**. Satellite Magazine is transmitted on SPN's transponder 21 every Thursday at 12 noon eastern time and lasts one hour. We will be making noticeable improvements in the program content and production quality about the time you read this. And highlights of** SPTS '80 **held last month in Miami will be included in the program for several months to come. We hope we saw you in Miami but if we did not you can see what happened there on the tube!**

PUBLIC SERVICE?

The Digest format is great and should help all the pioneers in this changing technology. I am completing final phases of my Howard Terminal as well as my own design for a 12 foot aluminum dish. As far as the LNA is concerned, I am waiting for a progress report on the Taylor Howard / DEXCEL do-it-yourself GaAs-FET LNA project or possibly the Coleman GaAs-FET LNA. In your November issue you mentioned the possible scrambling of HBO and SHOWTIME type services. I hope this is not the route these companies will take as they could actually increase their business by supplying to private terminals in rural areas where cable TV is not available and will not be available in the forseeable future. These companies could perform a public service as well as realize a significant increase in their income. I am a positive minded person and prefer to believe that most people possessing private terminals are honest and will pay a fee for these services. Like most pioneers in this new technology I am interested in the educational aspects of TVRO private terminals rather than the entertainment value. However, I am anxious to pay for these services since my family enjoys TV and we do live in a rural area away from Cable TV. I hope that HOMESAT and STARSCAN are successful in their efforts to legally make HBO and SHOWTIME type services available to private terminals for a reasonable fee.

Larry Wilson (Engineer)
90 South Belmar Drive SW
Reynoldsburg, Oh 43068

Well, since November's CSD very little has changed to make the prospects for legal, reasonable-fee, home service from SHOWTIME or HBO available. Keep in mind that The Movie Channel (formerly STAR CHANNEL) **is available at $96 per year for its new 24 hour per day service. That works out to $8.00 per month** (although paid in advance) **and if you and your family catch** one **good movie a month on the service which you would have gone into town to see in a theater, you've gotten your 8 bucks worth. If you catch two in a month, you are money ahead and can start to retire** (on paper) **some of the 'debt' of the TVRO!**

AUDIO ONLY

I would like to receive the American Forces Radio Service here in Panama; I am aware they are broadcasting this to our area via satellite as the local station always mentions that news

events and sports are carried to Panama via satellite. I would like to release myself from their local station as they are now not carrying the sporting events because they now transmit these via satellite to the TV system here. It seems to me that radio only reception equipment for reception of the satellite system should be much less expensive than a full TVRO terminal. Can you help me find a reasonable design to allow me to receive these audio-only transmissions?

Eugene Sasso Maduro
Panama, Panama

One of the big mysteries to us is via-what-bird the AFRTS station[s] in Panama [and elsewhere] are receiving their television [and audio] feeds. RCA has a contract to design an AFRTS system for world-wide coverage of American television [and radio] programs to U.S. bases overseas and the first part of the project calls for delivery of U.S. programming to places such as Panama, Guantanamo Bay [Cuba], Roosevelt Roads [Puerto Rico] and throughout Alaska. Yet Panama has apparently been receiving U.S. TV programming via satellite for a couple of years now although we are not aware of any program feeds on the existing [and visible] SATCOM, WESTAR or COMSTAR birds which seem to fit this pattern. Is it possible the U.S. Forces in Panama are receiving their U.S. radio and television via a military satellite (operating in the 8 GHz up and 7 GHz down band)? **If so, what a curious use for a military satellite! Perhaps there is a reader out there who knows something about this and is willing to enlighten us all.**

HOLY COW!

Please rush me information about: (1)Coop's Satellite Digest, what it costs and how to subscribe, (2)a list of all of your available STT VHS tapes which describe satellite TV system design and operation, and (3)a good source for quality X-Rated VHS tapes.

J. Jackson
Missouri

STT has been supplying VHS (and BETA - we care not which) **tapes that tell all about private terminal construction and operation for some 15 months now. We are right in the midst of re-producing our masters for virtually all of the tapes since we have recognized from the beginning that our original tapes offered were done in an amateurish way. We recently went way into hock** (Susan says too far into hock) **to install a first class production and editing system and Coop now spends more time in the tape room** (once upon a time it was the living room!) **than he does banging away at the typewriter. We'll have completely re-edited and much improved VHS and BETA format tapes available by April plus a whole new series of lower cost tapes. None will be X-rated** (we do have this great out take on one of the original masters done at Tay Howards where he describes, vividly, how his father used to help the neighbor 'water' his lawn but in today's society that brief excerpt probably wouldn't even rate a PG classification!).

SOUTH AFRICAN TVRO?

I have followed with great interest the series of articles describing direct satellite reception in the 3.7 to 4.2 GHz region but unfortunately have been unable to acquire much information about equipment available from here in South Africa. Would it be possible for me to receive satellite TV in the Johannesburg area? Which signals could I receive?

Where could I purchase a suitable parabolic antenna, LNA and receiver for this service?

I. Wagner
I. Wagner Engineering
P. O. Box 6642
Johannesburg 2000
South Africa

Every week we receive many letters from people scattered about the globe who have learned that international TV reception of a high quality is possible via satellites. Every area of the globe has different reception possibilities. In South Africa the best bets would be the INTELSAT satellites sitting over the western tip of Africa (above the Atlantic), **the INTELSAT birds resting over the Indian Ocean, and, one or more of the Russian satellites. All INTELSAT reception requires bigger antennas than are normally required for DOMSAT** (domestic satellites) **reception plus the willingness to view programming relayed either in native** (and usually foreign to your own) **tongues, and/or relayed as program segments rather than as full broadcast days. At the present time most INTELSAT reception involves twin receivers since in many cases the audio channel for the video is transmitted not as a subcarrier but rather as a SCPC** (single carrier per channel) **signal, often on a totally different transponder from the video. Probably within a year or two the audio for INTELSAT fed channels will join the video on a subcarrier but for now that is not the** common **approach. As far as finding equipment...virtually every issue of CSD lists numerous sources.**

UPGRADE AND RUSSIANS

Per the notice in the January **CSD** please upgrade my subscription to include both the technical and programming sections. Frankly it is not so much that I have become 'attached' (as you suggest) to both sections but rather with the little tidbits about scrambling, LNA cooling and so on that pop up in the programming section I thought I'd better take both.

I found the article about the Russian satellites interesting but of academic value only. Although there is some pleasure to be derived from successfully receiving those transmissions, few of us are fluent in Russian. I **would** appreciate any information available on receiving English/British TV via satellite. Having spent some time in Britain I can testify that their television is well worth receiving.

Daniel J. Ramer
Kinnelon, NJ 07405

Around 1-reader-in-8 receives only a single section [i.e. technical or programming] and 90% of these elect the technical section. When we send out samples we mail out a full Digest to show people what the complete edition contains. Anyone who wants to upgrade can do so for $20.00 additional per year (total subscription price is $50 in U.S./Canada/Mexico; $75 elsewhere **and** the elsewheres go via airmail). **Time-Life is planning to introduce 6 hours per day from British TV** (primarily BBC) **around 1 April; we suspect it will be on transponder 20, evenings. Cable systems are being charged $.09 per home per month for the service which is really twin feeds of three hours each** (for both coasts) **back to back. We have been** (and will continue to be for awhile anyhow) **'heavy' on Russian satellite data.** Why? **Well, it is a challenge. It also gives us an opportunity to show off something really exotic on an international basis since both Molniya and Statsionar have higher EIRP levels than the INTELSAT birds usually have. By 'upgrading' a private terminal to Russian reception you begin thinking about things like circular polarization** (i.e. the Birkill Hybrid Mode feed), **time-zone adjustments and different audio formats. The satellite TV system of the future probably won't be standardized on one set of technical formats for decades to come so the well equipped terminal will have to be flexible technically. Finally we have hundreds of readers outside the USA/Canada/Mexico chunk of ground who are dependent upon international class birds for their TV.** To them HBO and DOMSATs don't make any sense!

RAMSEY IS OK

I thought it was about time I told you how much I enjoyed SPTS '79 and now **CSD**. Back in '77 I was suggesting building a satellite receiver but I didn't know how and everyone I asked about it said it was impossible for a limited budget. It only took two years for the impossible to become relatively easy! Thanks to SPTS and **CSD** I feel I am witnessing the birth of an important new industry. I also find the Sunday Satellite Ham Net very informative and although I have never found time to get my ham radio 'ticket' I am listening every Sunday and when I do have a questions I call Jim Keeth (AF9A) who is here locally and who checks in each Sunday. Jim and I work together

at RCA and have been collaborating on our satellite receiver. Our progress has been slow but deliberate and that isn't all bad since we are not yet locked into some outmoded technology.

I was very excited to hear about the new Washburn Receiver (Manual) and the fact that circuit boards, parts kits or full units will be available from Ramsey Electronics. I have dealt with Ramsey before and found them to be honest. I bought a frequency counter kit from them which had two bad ICs. They replaced them promptly when I called and that was a nice bit of concern to me.

Lastly I am enclosing a printout of antenna aiming parameters for your **CSD** location. I am willing to make these printouts available to anyone for one (US) dollar plus a (US) stamped and self addressed envelope (standard number 10 business size).

Ronald Waltner
353 N. Kenyon
Indianapolis, IN 46219

We too believe the relationship with Ramsey Electronics will be a healthy one for this newly emerging industry. Frankly the reaction to the Washburn Receiver (and manual) **at SPTS '80/Miami was so outstanding that we can see Ramsey having some possible delivery problems with everything but circuit boards for awhile. The crowds at the Ramsey booth were so thick you could hardly get through most times! Waltner's Geostationary Bearings antenna pointing chart is a good one and we suggest that anyone looking for antenna azimuth, elevation and ranging data on the SATCOM, WESTAR, STATSIONAR, ANIK or COMSTAR birds drop a dollar** (with an envelope as suggested, pre-stamped) **to Ron for a copy. Provide your own geographic coordinates to the nearest ten minutes or so of course.**

BIRD OPERATIONAL NOTES

WESTERN UNION, in a move similar to that taken by RCA 18 months ago, auctioned off a group of WESTAR transponders (seven in all). Takers included ABC, CBS, Hughes TV Network, Bonneville Broadcasting, SIN, Video Communications Inc., Robert Wold, Cable News Network and SCN.

Two commercial-syndicated program users of satellite aimed at distributing programs to major market TV stations are scheduled for satellite start on WESTAR this fall. **Blairsat** and **Vidsat** expect to be beaming shorts, commercials and specials into around 50 combined markets by the end of 1980.

RCA's SMARTS system, designed as their answer to getting every TV station in the country to 'go satellite' meanwhile will begin transmissions this month on a test basis. Only a handful (four) of the stations are involved but it is a start.

FCC approval allowing PBS's 148 downlinks and 5 uplinks to be shared with Western Union is expected to have major impact on transmission of broadcast programs to commercial stations across country. PBS system is already in place and approval will mean many new 'shared' users.

Not all private terminal operators are going non-license route. FCC released data for January shows a James M. Barker of Hamburg, Arkansas as recent applicant for a private - licensed terminal. AFC (Microdyne) provided the hardware according to FCC. PTL meanwhile recently reported it has 15 private terminal systems viewing its program; at least that's what their internal records show!

Market for 1980 earth terminals continues to be subject for predictions. Even discounting **any** private terminal sales AFC's Howard Hubbard sees 1,500 to 2,000 terminals being installed in US during 1980. AFC will announce a new 3.7 meter $3,000 antenna shortly; their 7 meter antenna is reported to be producing 10.5 to 11 dB CNR measurements at private terminals in the Bahamas with 120 degree LNA and Microdyne 24 channel radios; from SATCOM FI.

WESTAR IV contract, for a 24 channel bird, reportedly has gone to Hughes. Bird will be similar to SBS, Telesat Canada and Palapa.

Nevada hotels and casinos continue to be big buyers of terminals although market may be approaching saturation. Most are going license route; FCC granted three in one recent week.

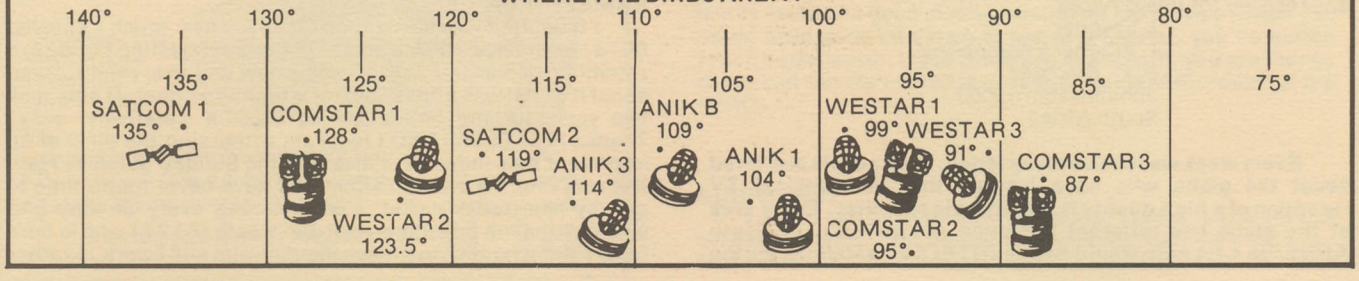
RCA received expected waiver to proceed 'with haste' on construction of FIV bird; to replace FIII lost in space.

BBC programming scheduled to start around 1 April on SATCOM FI transponder 20 is attracting wide interest. Schedule calls for 42 hours per week, six per day, with twin feed of three hours each (back to back) for east and west coast viewers. Programming will repeat with 12 new hours each **week** out of 42 with new programming introduced on Monday, Wednesday, Friday and Saturday. Cable systems will now pay 9 cents per home per month with discounts. Programming will start at 7 PM daily for east and re-start at 7 PM pacific for west.

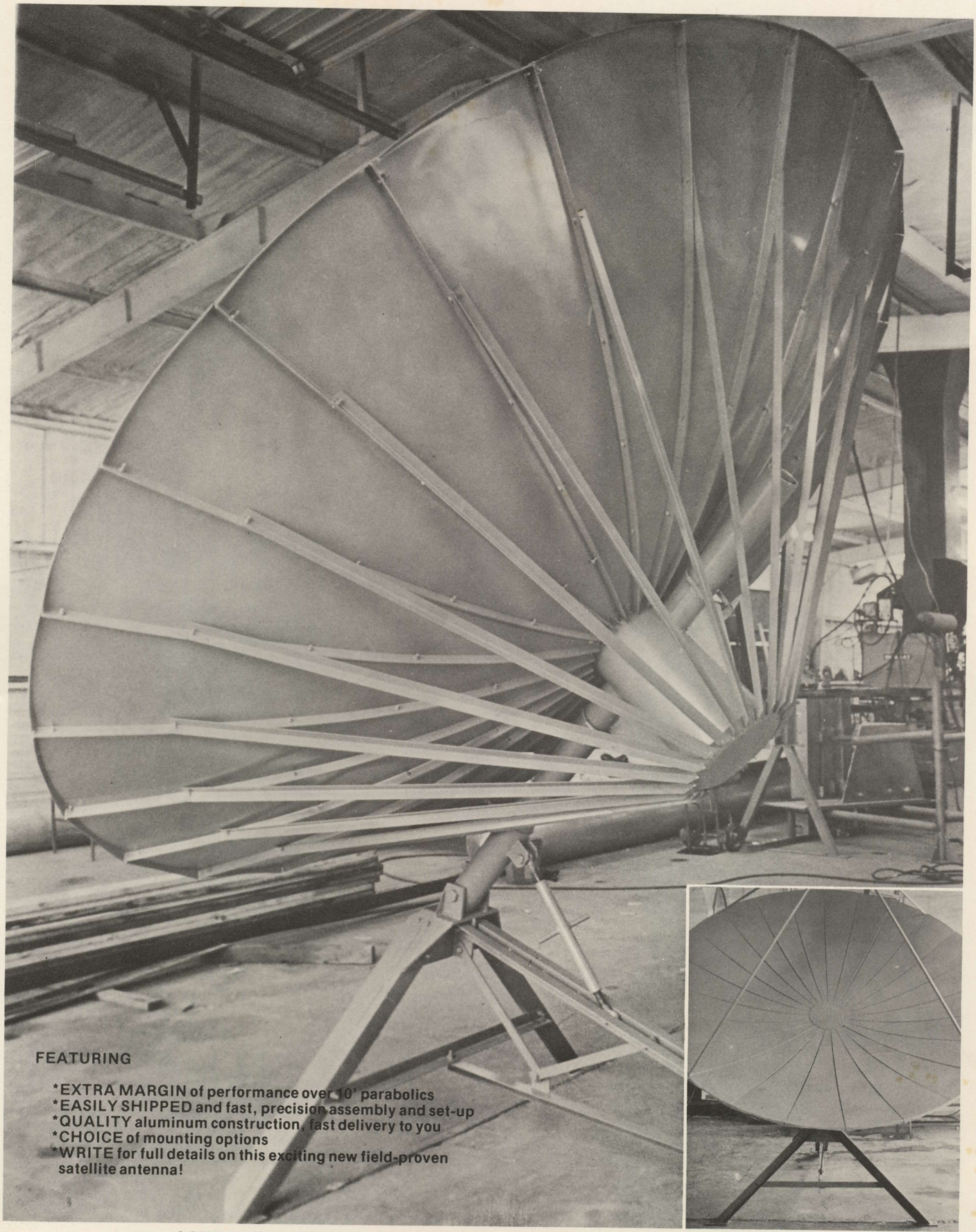
RCA hoping to restructure failed SATCOM FIII network by placing some new cable program suppliers on FII (119 degrees west; see **CSD** for February) as early as this month. RCA plans to move some of their data and message traffic off to COMSTAR birds on sub-let basis. Most likely FII transponders to watch for signs of new cable programming during March-April period will be: **2, 4, 5, 6, 8, 9, 10,** 13, 14, **16,** 17, 18, **20,** 21, **22** and **24**. The most probable to be used (first) are in bold face. Yes, those are all horizontally polarized.

Want to transmit internationally? You can now purchase a combined audio and video feed of ten minutes duration from INTELSAT for $168.50 provided you 'hand' feed to uplink and take service at downlink yourself. If the rates keep dropping we may be able to hold a truly international SPTS one year soon with participants from all six continents 'checking in'!

WHERE THE BIRDS ARE...



INTRODUCING: ADM's ELEVEN FOOT SATELLITE ANTENNA



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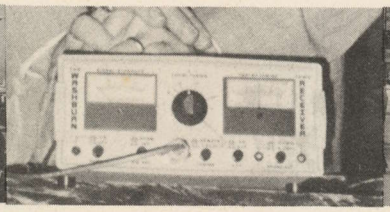
ANTENNA DEVELOPMENT AND MANUFACTURING, INC.
2745 Bedoll Av., P. O. Box 1178, Poplar Bluff, Mo. 63901
Telephone (314)785-5988

Progress Report:

WASHBURN TVRO RECEIVER at SPTS '80 MIAMI

SPTS '80 MIAMI had so many exciting technology innovations it would be difficult to label any single item as the ''Hit of the Show''. The introduction of the new Washburn High Performance TVRO Receiver came close to ''stealing'' the show however. For those who missed this exciting new receiver in Miami here are some frequently asked questions which may help you make up your mind as to whether your new TVRO terminal should be built around the Washburn Receiver (manual).



1]TEST EQUIPMENT - What type will you need to duplicate the high performance receiver? Remember you can build some modules on your own and acquire more complex modules already built and tested from Ramsey Electronics, or build it all yourself (circuit board layouts are in the manual; boards are available from Ramsey Electronics). If you build it all, you'll need 70 MHz sweep and marker equipment, a signal generator (to 300 MHz in a pinch, 1,000 MHz is better), a frequency counter (300 MHz in a pinch, 1,000 MHz is better again), a DVM(digital voltmeter),Hi-Z voltmeter, RF detector probe, a scope (usually found with the 70 MHz sweep / detector system) and an accurate ohmeter.

2]SENSITIVITY - Yes, the unique threshold extension design does allow you to reduce the antenna/LNA requirements. The Washburn Manual from STT explains in great detail how you select your LNA and antenna (size) based upon three different levels of service you can select (from home-quality through professional quality). In many situations a ten foot reflector with a 120 degree LNA and the Washburn Receiver **will** get you home quality pictures where a much larger antenna (14 foot or larger) would be required with a receiver that does **not have** the threshold extension feature.

3]OFF SHORE USE - Yes, provisions are included in the manual for operation from 220 VAC mains. You can order the system wired and tested for CCITT audio formats and non-DOMSAT aural subcarriers (the manual shows you how to cover from 5.6 to 7.4 MHz subcarriers). AND - the threshold extension feature becomes VERY important in weak signal areas.

4]BUY SOME/BUILD SOME - If you feel uncomfortable working above 100 MHz, or lack test equipment for same, you can elect to buy individual modules operating above the low (70 MHz) IF wired and tested and then complete the power supply, 70 MHz IF and demod, cabinet and VCR interface (modulator) plus feed rotational control system on your own.

STT's brand new **''Washburn [High Performance] TVRO Receiver Manual''** is our most outstanding manual to date. Over 50 pages, large fold-out schematics, parts assembly drawings and detailed construction and alignment instructions. **PLUS** - each purchaser of the STT Washburn Manual receives **a 10% discount** when ordering either the full circuit board set, or the full kit, or a wired and tested receiver from Ramsey Electronics!

To order your STT Washburn Manual, use order card in this issue of CSD [colored blue] or send $40.00 [$45 outside of USA, Canada, Mexico; always in US funds please!] to: SATELLITE TELEVISION TECHNOLOGY • P. O. Box G • Arcadia, OK 73007